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UNITED STATES NUCLEAR REGULATORY COMMISSION'S

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

March 7, 2007

The contents of this transcript of the proceeding of the United States Nuclear Regulatory Commission Advisory Committee on Reactor Safeguards, taken on March 7, 2007, as reported herein, is a record of the discussions recorded at the meeting held on the above date.

This transcript has not been reviewed, corrected and edited and it may contain inaccuracies.

1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

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4 ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

5 MEETING OF THE SUBCOMMITTEE ON FUTURE PLANT DESIGNS

6 + + + + +

7 WEDNESDAY,

8 MARCH 7, 2007

9 + + + + +

10 The meeting was convened in Room T-2B3

11 of Two White Flint North, 11545 Rockville Pike,

12 Rockville, Maryland, at 10:00 a.m., Dr. Thomas

13 Kress, Chairman, presiding.

14 MEMBERS PRESENT:

15 THOMAS KRESS Chair

16 WILLIAM SHACK

17 MARIO BONACA

18 DANA POWERS

19 MARIO BONACA

20 SAID ABDEL-KHALIK

21 GRAHAM WALLIS

22 OTTO L. MAYNARD

23 MICHAEL CORRADINI

24 GEORGE APOSTOLAKIS

25

1 NRC STAFF PRESENT:

2 DAVID FISCHER Designated Federal Official

3 MARY DROUIN Office of Research

4 MARTIN STUTZKE NRR

5 JOHN MONNINGER NRR/Brookhaven Labs

6 VINOD MUBAYI

7 STU RUBIN

8 ALSO PRESENT:

9 JOHN LEHNER

10 TOM KING ISL

11 BRUCE MRORCA

12 BIFF BRADLEY

13 ED BURNS

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A-G-E-N-D-A

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Ms. Drouin, Mr. Stutzke, Mr. Monninger, Mr. King

Licensing Manager for Pebble Bed 269

Mr. Burns

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

2 9:43 a.m.

3 CHAIRMAN KRESS: This is a meeting of the
4 Advisory Committee on Reactor Safeguard, Subcommittee
5 on Future Plant Designs.

6 I am Tom Kress, Chairman of this
7 Subcommittee.

8 Members in attendance are supposed to be
9 some of these, they're not all here yet, Dr. Said
10 Abdel-Khalik, George Apostolakis is supposed to be on
11 his way. I don't know where Sanjoy Banerjee is.
12 Mario Bonaca. Mike Corradini is supposed to be here.
13 I don't know if the weather's got them or not. Mr.
14 Otto Maynard, Dana Powers, Bill Shack and Graham
15 Wallis.

16 The purpose of the meeting is to review
17 the staff's work on the technology-neutral licensing
18 framework, which is in working draft NUREG-1860. And
19 the focus is on ensuring the value of such an approach
20 versus the development of a licensing framework for
21 specific design, such as a high temperature gas cooled
22 reactor or a liquid metal cooled reactor.

23 During the briefing the Committee will
24 also explore with the staff the pros and cons of
25 developing a licensing framework for specific designs.

1 The Subcommittee will hear presentations by and hold
2 discussions with the staff and other interested
3 persons regarding this matter.
4 The Subcommittee's job is to gather
5 information, analyze the relevant issues and facts and
6 formulate proposed positions and actions as
7 appropriate for deliberation by the full Committee.
8 Dr. David Fischer is the Designated
9 Federal Official for this meeting.
10 The rules for participation in today's
11 meeting have been announced as part of the notice of
12 this meeting previously published in the *Federal*
13 *Register* on September 25, 2006.
14 A transcript of the meeting is being kept
15 and will be made available as stated in the *Federal*
16 *Register* notice.
17 It is requested that speakers and others
18 identify themselves. Come to a microphone first and
19 speak with sufficient clarity and volume so that they
20 can be readily heard. That really means come to a
21 microphone.
22 We have received no written comments or
23 requests for time to make oral statements from any
24 members of the public.
25 I would encourage those present to feel

1 free to offer comments on specific items as we proceed
2 through the agenda. This is going to be somewhat of
3 a freewheeling meeting. It's an interchange rather
4 than as opposed to mostly formal presentations.
5 Also, I intend to try my best to enforce
6 our agreement to allow the speakers the first ten
7 minutes without interruption. Now, I implore the
8 Committee to help me with that, because that would be
9 very helpful. In the first ten minutes there is going
10 to be an overview.
11 MEMBER WALLIS: It must depend on what
12 they say.
13 CHAIRMAN KRESS: It's going to be an
14 overview.
15 MEMBER WALLIS: The first ten minutes is
16 introduction. If the first ten minutes is overview
17 and introduction, that's fine.
18 CHAIRMAN KRESS: That's right.
19 MEMBER WALLIS: But if there's a technical
20 matter raised --
21 CHAIRMAN KRESS: No, I think it's an
22 overview.
23 MEMBER WALLIS: Okay.
24 CHAIRMAN KRESS: And then we'll get into
25 the same technical issues after that ten minutes.

1 But with that, I'll call upon Mary Drouin,
2 I guess, to introduce the staff and the subject
3 matter.
4 MS. DROUIN: Good morning. We're
5 delighted to be here. I'm Mary Drouin with the Office
6 of Research.
7 Sitting at the table with me is Marty
8 Stutzke from -- I'm not sure where he said where he's
9 from, kind of in the middle.
10 MR. STUTZKE: NRR and then later to NRO in
11 April.
12 MS. DROUIN: Also at the table is John
13 Monninger from Brookhaven National Labs and Tom King
14 from ISL.
15 Before we get started, I want to turn it
16 over to John Monninger.
17 MR. MONNINGER: Good morning, Mr. Chairman
18 and fellow ACRS Members. My name is John Monninger.
19 I'm the Deputy Director for Probabilistic Risk and
20 Applications from NRC's Office of Nuclear Regulatory
21 Research.
22 First of all, I'd like to thank you very
23 much for the opportunity to come down and discuss this
24 important project with you. As, you know, we
25 appreciate the interest from the ACRS. And, as you

1 are well aware, the Commission is also interested in
2 the future of this project.
3 We've been at it for the past three years.
4 It's been an agency effort. We've had, you know, had
5 interactions with NRR, the Office of Nuclear Reactor
6 Regulation and support from NRO also.
7 We've had several significant workshops
8 and meetings with stakeholders out there to try to
9 guide the development and insights into this project.
10 As you're aware, we issued it for public
11 comment as part of a advanced notice of proposed
12 rulemaking last year. It would be a new potential
13 rulemaking for a new Part 53. In support of that we
14 held additional meetings with stakeholders.
15 I think one thing that's important, as
16 you'll see through this discussion, is though the
17 project has been ongoing for the past three years
18 there's been some recent developments that play into
19 this project also. In particular, I guess, you know
20 the passage of the Energy Policy Act and the need for
21 the NRC and DOE to work collectively together in the
22 development of a licensing strategy for the next
23 generation nuclear power plants.
24 So, you know, the past year so we've been
25 cognizant of these other initiatives out there and

1 ongoing and we're trying to balance what we have
2 learned from this effort, the technology-neutral
3 framework, into the agency's future efforts for the
4 NCNP projects.
5 So with that, I'll turn it back over to
6 Mary Drouin. Or also, I should introduce Eileen
7 McKenna. Her organization, NRR/NRO, they actually
8 have the lead for the ANPR, the Part 53 efforts.
9 MS. DROUIN: Okay. We're here today to
10 have a technical exchange on the framework document,
11 particularly all the technical issues. There are a
12 lot of technical issues in this document, somewhat
13 complex. And we've got the whole day to go through and
14 it'll take us all day if not, you know, more.
15 But I want to go through briefly some
16 introductory remarks, give you an overview of the
17 framework that's not technical. It's an overview of
18 what this framework is conceptually. And we did ask
19 that we could do that uninterrupted. And then get
20 into the technical discussion in a round table format.
21 We haven't prepared a lot of viewgraphs
22 for the round table because it's meant to be informal
23 and we didn't want to come in with a formal
24 presentation. We have some key viewgraphs, you know,
25 for each of the technical topics. We've got a copy of

1 the framework document here. Hopefully, all the
2 Members also have a copy.
3 I think John touched on a lot of this.
4 You know we started back in January 2003. The
5 Advanced Reactor Research Plan recognized the need for
6 a new licensing framework for future reactors. And the
7 program was initiated back then. You know the need
8 for it was because our current regulatory structure
9 has been very focused on light water reactor
10 technology. And so when you start thinking about some
11 of these unique aspects of these advance reactors that
12 it begs the questions how applicable or how burdensome
13 is it would it be to use the current Part 50. And
14 then also when you start looking towards implementing
15 the PRA policy statement and trying to bring risk in
16 an integral manner as an integral part then with this
17 in the midst of risk-informing Part 50 there's --
18 MEMBER WALLIS: Am I allowed to ask a
19 question, Mr. Chairman? It's to clarify this here.
20 CHAIRMAN KRESS: Okay. I will allow that.
21 MEMBER WALLIS: Okay. What do you mean by
22 a PRA? What's the --
23 MS. DROUIN: A probabalistic risk
24 assessment.
25 MEMBER WALLIS: No, no. What's the output

1 from the PRA? Is it CDF or is it a more comprehensive
2 assessment of the effects on the public?
3 MS. DROUIN: When I use the word PRA, I am
4 using it in its entirety here.
5 MEMBER WALLIS: So it doesn't necessarily
6 mean that CDF is the output?
7 MS. DROUIN: That's right.
8 MEMBER WALLIS: Okay. That's good. Thank
9 you.
10 MS. DROUIN: That's right, yes.
11 Okay. Just real quick on the status. You
12 know, all the initial work in terms of what we've
13 planned to do in this framework document has been
14 completed and we're in the midst of publishing it.
15 It's going to be NUREG-1860 to be published in the
16 early summer. We're looking at the June time frame.
17 We're going to get more into this the next
18 bullet as we get into the technical discussion, but I
19 wanted to bring it up right away: Is that we have
20 coined new phrase "risk-derived." And it's very
21 important to this document versus using the term
22 "risk-informed." And we'll get more into that.
23 And another major aspect of the framework
24 is that we really did try to integrate looking at the
25 severe accident, the instant reactors, the PRA and the

1 safety goal policy statements and all the expectations
2 that were outlined in these policy statements by the
3 Commission we have tried to be very faithful in
4 integrating. And that provided some challenges to us.
5 The ANPR which attached the framework to
6 it -- not attached but referenced it, there were seven
7 topics in that ANPR. Out of those seven topics five
8 of them were related to the framework. And I think
9 there were some 70 odd questions in the ANPR. And out
10 of those 70, I think a good 60 of them were related
11 directly to the framework.
12 Listed there are the stakeholders that we
13 received comments from. And in some cases you can see
14 some of the commentors sent in two sets of comments.
15 Because the ANPR was issued in May, it didn't close
16 until December. When we issued it in May we put on
17 the website the latest version of the framework
18 document. And we put a newer version, a completed
19 version in July. So that was a lot of the reason why
20 you see two sets of comments. And also, just because
21 it was very complex. So we received some sets in
22 September and then more detailed comments in December.
23 What I'm going to go over just very
24 quickly is not any of the technical comments yet that
25 we received. We'll get into that. But I want to give

1 you an overall at a high level in terms of where we
2 should be moving forward. In terms of the overall
3 view whether this should be technology-neutral versus
4 technology-specific. And whether and how we should
5 move forward to rulemaking. Just really give you a
6 very high level sense of that.
7 And then later on we do have comments for
8 the technical input we received.
9 Whether or not we should go to the Part
10 53, here's some example comments. You know, we should
11 move forward. They support the effort.
12 We had this one comment that we've
13 departed too far from the deterministic approach. And
14 the basis for that is because they feel like we have
15 totally departed from addressing common cause
16 failure. I'm not really sure where that comment came
17 from because we haven't done that.
18 But overall the comments were generally
19 supportive of trying to move forward.
20 Technology-neutral versus technology-
21 specific? A mixture of views and they all came down
22 to some supported the technology-neutral regulation
23 with implementing guidance technology-specific, Some
24 supported going directly to regulations that were
25 technology-specific. And then some indicated it was

1 too premature to decide. So there was no consensus
2 there across the stakeholder comments.
3 How we should proceed forward with regard
4 to rulemaking. I think, you know, it was kind of a
5 general consensus when you looked at the different
6 ones that we should not to rulemaking right away. You
7 know, gain some experience first. One suggestion was
8 first do a design certification with a non-LWR used in
9 the framework.
10 Another one, they talked about this multi-
11 year phased approach to rulemaking. They didn't quite
12 explain it, but I think it probably went in line with
13 using the step approach was to develop first a draft
14 rule, put it out for information, review and approve
15 an on non-LWR design use in a 50.52 process, evaluate
16 the draft rule against that and then publish the draft
17 rule for comment. But the main point is that don't go
18 to rulemaking right away in the near term.
19 So, our next step, as I said, we're going
20 to publish 1860 in early 2007. We're looking towards
21 the June time frame.
22 We are in the midst of preparing a second
23 paper to respond to the Commission SRN to provide the
24 staff recommendation on whether, and if so how to
25 proceed with rulemaking. In the paper right now our

1 thinking is that all activities related to the
2 framework to be terminated and evaluate the need to
3 defer rulemaking until experience is gained with NGNP
4 and GNEP.
5 We do plan to come in May to discuss more
6 fully this paper.
7 MEMBER WALLIS: I guess we've passed ten
8 minutes now, huh?
9 MS. DROUIN: I know.
10 MEMBER WALLIS: This comes as a NUREG.
11 And yet there seems to me there are many ways in which
12 one could do it other than the way that you've laid
13 out in the framework. I think as a NUREG gives it a
14 kind of authority. And I hope this won't snuff out
15 attempts to do a different job which could be better.
16 CHAIRMAN KRESS: Yes, that's what concerns
17 me about the bullet that says "All activities related
18 to Framework to be terminated." Right. I think there
19 are still some things to fine tune it, maybe, to
20 explore other --
21 MS. DROUIN: Let's come back to that at
22 the end, the end of the day. Because that's going to
23 tell you exactly what we're going to be doing with
24 this framework in addressing some of those.
25 CHAIRMAN KRESS: Yes, but you know, it

1 sounds to me like in this bullet that this what you're
2 going to recommend to the Commission that all
3 activities--
4 MS. DROUIN: That is what is being
5 discussed by management.
6 CHAIRMAN KRESS: Yes. Well, I hope they
7 don't do that. But I think there's sort of some work
8 to be done and be useful.
9 Proceed, please.
10 MS. DROUIN: Okay. I'm going to try and
11 go through these real quick also. I apologize I'm
12 taking a little more than ten minutes. But that's
13 because, John, we gave him some time. So his time
14 really doesn't count.
15 CHAIRMAN KRESS: That's all right. You
16 should have almost another five minutes.
17 MS. DROUIN: Thank you.
18 Okay. You know, probably a big lesson
19 we've learned is time to really explain what this
20 framework document is. And it's amazing all the
21 different understandings of what this framework is.
22 So just really try to explain what this framework is,
23 what it is not.
24 It is not regulation. I am amazed at how
25 many people think that this document is a set of

1 regulations. It is not. It's a framework. It's set
2 of technical guidelines and criteria.
3 It could serve as the basis for
4 rulemaking. It uses this risk-derived approach, and
5 I am going to get into that. And it can be applied
6 and implemented on either technology-neutral or
7 technology-specific basis. I think we did ourselves
8 a disservice from the very beginning calling it a
9 technology-neutral framework, and we tried to remove
10 those words from the title because it can be applied
11 to either technology-neutral or technology-specific.
12 We've approached it from a technology-neutral so that
13 it could be applied to any reactor technology, and
14 somehow we've miscommunicated that.
15 Risk-derived and risk-informed, I'm going
16 to give you a little bit of a hint here. We're going
17 to really get into this when we get into round table
18 discussion of our probabilistic approach. But if I
19 look at Part 50 right now, Part 50 you have a gross
20 set of regulations that were based on deterministic
21 criteria. It's a deterministic foundation. We are now
22 coming in and using risk insights to modify it where
23 we think it's appropriate. That's what we mean as a
24 risk-informed approach. It started from a
25 deterministic foundation.

1 What we've done in this framework is we've
2 starting from a probabilistic foundation and we've
3 come in and modified it and integrated deterministic
4 and defense-in-depth criteria to deal with
5 uncertainties. But we've started from a probabilistic
6 foundation.
7 And these two things don't necessarily get
8 you to the same place. Ideally they should, but I
9 don't think they will because we're not coming in and
10 risk-informing Part 50 in an integrated manner. We're
11 picking things here and there. So I don't think
12 ultimately they will get you to the same place. And I
13 think that's --
14 MEMBER ABDEL-KHALIK: But that's sort of
15 really part of my major concern in a sense that in the
16 previous slide you say that "this can serve as the
17 technical basis for rulemaking --
18 MS. DROUIN: Right.
19 MEMBER ABDEL-KHALIK: Right. So
20 presumably a licensee who wishes to license a current
21 generation reactor can use this approach --
22 MS. DROUIN: Yes, it could.
23 MEMBER ABDEL-KHALIK: -- instead of Part
24 50. And it is quite possible that by doing this they
25 end up with less stringent criteria than the current

1 Part 50. At least in reading this there is no way I
2 can assure myself that if a licensee were to follow
3 this approach, they would end up at the same point
4 that they would end had they used Part 50.
5 MS. DROUIN: Okay. I mean, I don't want to
6 get into a detail on that. But just a quick answer.
7 I disagree with your word "stringent." I think they
8 will end up at a safer place. They may not the same
9 requirements, but I think they will end up at a safer
10 place than the current set. That's my personal thing.
11 MEMBER ABDEL-KHALIK: Well, my concern --
12 MS. DROUIN: So "stringent" to me is not,
13 I don't think, the correct word.
14 MEMBER ABDEL-KHALIK: But my concern is
15 that this may serve as sort of a way to get around
16 some of the requirements in Part 50. For example,
17 using the double-ended guillotine break as a design
18 basis accident. Would this be a way for a licensee to
19 get around that requirement and use, you know, a
20 smaller size break like Part 50.46?
21 MS. DROUIN: How the requirement would
22 turn out in terms of a comparable §50.46, I couldn't
23 tell you at this point.
24 MEMBER ABDEL-KHALIK: But if that is the
25 case, then it would be a less stringent requirement?

1 MS. DROUIN: No. No. Not at the overall
2 risk. I don't agree with that. I truly don't.
3 MR. KING: I think it could possibly be a
4 better requirement.
5 MS. DROUIN: That's what I'm saying.
6 MR. KING: Because it's not going to
7 require diesel generators to start as fast, valves to
8 close as fast. It will make them more reliable.
9 So you got to look at both sides of this.
10 MEMBER ABDEL-KHALIK: Well, at the end of
11 the day it has to be really demonstrated to me that
12 the point I was trying to make is that going through
13 this route or the old route, you're not going to
14 necessarily end at the same point.
15 MS. DROUIN: Yes.
16 MEMBER ABDEL-KHALIK: And the point is
17 where we end up has to be demonstrated to be safer
18 than --
19 MEMBER WALLIS: Well, Said, what's your
20 criterion for being safer?
21 MEMBER ABDEL-KHALIK: Overall risk to the
22 public.
23 MEMBER WALLIS: Okay. So that's their
24 basis. And if they can show that there's less risk
25 with their approach than Part 50, then good for them.

1 CHAIRMAN KRESS: I think in order to
2 arrive there, you have to have the technical
3 functional equivalent of a CDF and a LERF that's
4 technology-neutral as an overall assessment of the
5 status of the design. And that's the one little part
6 that I saw was missing from the framework.
7 MS. DROUIN: Right.
8 CHAIRMAN KRESS: But we'll get into that.
9 MS. DROUIN: That's going to be our very
10 first technical issue when we get to the foundation.
11 CHAIRMAN KRESS: Wonderful. Wonderful.
12 But in my mind that would ensure you end up at a
13 better state.
14 MS. DROUIN: Right.
15 CHAIRMAN KRESS: Or at least the
16 equivalent state.
17 MS. DROUIN: Because I do think that this
18 approach takes you to a safer state.
19 CHAIRMAN KRESS: Yes, I think it does.
20 MS. DROUIN: Okay. I think I've kind of
21 said. You know, you got the framework which is the
22 guidelines criteria. You implement the framework to
23 get you to your regulations and regulatory guidance.
24 I'm not going to go through these because
25 we're not meant to quibble on any of these words. All

1 this is meant to show you here because people have had
2 this "well, what does mean when you actually start
3 writing some regulations based on this?" So all I've
4 tried to do here is show you an example of the scope
5 and level of detail of what we're talking about.
6 And what you have here in the right hand
7 column is, for example, where it says FW framework.
8 This would be a new regulation. You don't see this
9 regulation anywhere in the current Part 50. It's a
10 framework. It only needs to be written at a
11 technology-neutral level.
12 CHAIRMAN KRESS: A question, Mary. If one
13 wanted to go from the framework to regulation, do you
14 have an idea how long that would take? Is it two
15 years like normal regulation or three?
16 MS. DROUIN: We had actually looked at
17 laying out a schedule. And I think it comes down to
18 not so much writing the regulations, but the
19 developing regulatory guidance that would have to go
20 with it and how much of that you would need to write.
21 CHAIRMAN KRESS: So to go to full blow
22 regulation here would take quite a while? A lot of
23 effort?
24 MS. DROUIN: I don't think it's a ten year
25 effort.

1 CHAIRMAN KRESS: Five?

2 MS. DROUIN: I think you could do it in

3 five years.

4 CHAIRMAN KRESS: Just, you know, that's

5 all I wanted, was some sort of an idea.

6 MS. DROUIN: I think you could do it in

7 five years.

8 CHAIRMAN KRESS: Because we're supposed to

9 respond to this Commission.

10 MS. DROUIN: Yes.

11 CHAIRMAN KRESS: That's part of the

12 element of my thinking is how long it's going to take

13 to go.

14 MS. DROUIN: The next one is just to show

15 that we're not abandoning good past thinking. So

16 here's an example where it's the maintenance rule

17 where we would take the language from the maintenance

18 rule and then we would add stuff. So you can see that

19 right here that we take §50.65 and then is what we

20 would add based on the framework. And we think this

21 can remain technology-neutral and it would be equally

22 applicable to all technologies.

23 Here's the example of one where the rule

24 could be written. It would come right out of the

25 framework, not a comparable in Part 50. The rule

1 would be written at this technology-neutral level but
2 would be implemented on a technology-specific basis.
3 So you'd have to have implementing guidance for each
4 reactor technology.
5 We put these two in because we think these
6 are critical just to show there would be regulations
7 for PRA which don't show up now. These are coming
8 directly out of the framework. And, again, we don't
9 think they would have to be written on a technology-
10 specific level, technology-neutral we think would be
11 adequate.
12 So you can look at these at your leisure.
13 But these are not hard and fast words. This was just
14 to give you an idea of what you would see if you
15 implemented the framework.
16 MEMBER POWERS: What I don't understand,
17 Mary, if we go to energetic reaction control--
18 MS. DROUIN: How do I go back?
19 MEMBER POWERS: That as written doesn't
20 tell me what I'm supposed to achieve.
21 MS. DROUIN: That's right.
22 MEMBER POWERS: Whereas the corresponding
23 regulation in 10 CFR Part 50 deals only with what I'm
24 supposed to achieve. I mean, it's kind of
25 interesting.

1 And §50.46 says thou shall not have more
2 than one percent overall reaction of your clad and no
3 more than 17 percent and the most reacted part of the
4 core. And the whole purpose for saying that is to
5 assure you have ductility in the cladding after
6 functioning of the ECCS.
7 The trouble I see with this without
8 telling me what I'm supposed to achieve is that I can
9 say, okay, on Tuesday I don't turn on a water facet
10 and that in some way prevents and mitigates --
11 anything will satisfy that requirement.
12 MS. DROUIN: That's why you see this slash
13 here. Because here's how to write it. We don't think
14 you could go much further -- you know,you maybe could.
15 But I didn't want to get into -- you know, I knew I
16 was going to pick one example, that was going to be a
17 bad example.
18 MR. KING: Well, I think the answer to
19 your question is what needs to be achieved is stated
20 in a different requirement in terms of meeting the
21 frequency consequence occur, meeting the QHOs.
22 There's some deterministic requirements --
23 MS. DROUIN: Right.
24 MR. KING: on the on the license basis on
25 this.

1 MEMBER POWERS: Then why have this rule
2 here at all? If that's going to be what you're trying
3 to achieve, then why have this rule?
4 MR. KING: Well, you can argue that. But
5 I think this rule is to remind people that this is an
6 important area, sodium water reaction, fuel coolant
7 interaction. And it's sort of a deterministic rule and
8 so you need to have some provisions in to deal with
9 these types of accident. But I think your argument,
10 you could argue that maybe you don't need this because
11 you've got these higher level acceptance criteria.
12 MEMBER POWERS: Yes, but if you don't tell
13 me where I'm trying to achieve, there's no point in
14 having a rule. Because anything satisfies you.
15 MR. KING: Well, not anything. You still
16 have to meet the frequency consequence curve and the
17 QHOs --
18 MEMBER POWERS: In a separate requirement.
19 This rule here, anything I do satisfies that. So it's
20 nonfunctional.
21 MR. LEHNER: I think you have to a
22 technology-specific for this rule, depending on the
23 specific technology.
24 MEMBER POWERS: I think you just don't
25 need it.

1 MR. LEHNER: Oh.

2 MR. KING: But you can't take them

3 individually. This set of rules is a package.

4 MEMBER WALLIS: It's not as a rule and

5 it's something you have to consider when you're

6 looking at where things lies on the FC curve, isn't

7 it? It's not a separate rule.

8 MEMBER POWERS: Yes. But why do I have to

9 write something down --

10 MEMBER WALLIS: I don't think it is a

11 separate rule.

12 MEMBER POWERS: -- here that's

13 nonfunctional.

14 MEMBER WALLIS: I don't think you need a

15 separate rule.

16 MEMBER POWERS: Well --

17 MS. DROUIN: I think Dave has got a point.

18 We're not here to debate whether or not this

19 particular rule should exist or not.

20 MEMBER POWERS: But it's enlightening on

21 the philosophy with which we're developing this.

22 MS. DROUIN: Yes, it is. And from that

23 perspective I think we need to take that into

24 consideration.

25 MEMBER SHACK: But it's perhaps more

1 equivalent to a GDC than a rule.

2 MS. DROUIN: Well, GDC is a rule.

3 MEMBER SHACK: Well, in a sense that we

4 think of §50.46 as a rule rather than the GDCs, which

5 are much more general requirements.

6 MS. DROUIN: Right. I mean, unfortunately

7 §50.46 to me is a unique rule in that it's so

8 prescriptive and so specific.

9 MEMBER POWERS: Another way you can

10 approach this thing is with a little effort I probably

11 can come up for any given system with a 100,000

12 chemical reactions. A modest amount of effort. Some

13 fraction of them will be exothermic. And I can

14 question a licensee to death on "oh, what did you

15 about this reaction? How about this reaction over

16 here? What about this one here?"

17 MR. KING: Yes. I don't see anything

18 necessarily wrong with that. You're just checking the

19 completeness of their analysis.

20 MEMBER POWERS: It might take a while to

21 get it done.

22 MR. KING: But you know the major ones,

23 you know.

24 CHAIRMAN KRESS: One way I interpret the

25 useful of this is if you did have FC criteria that

1 have to be met, this is a PRA thing that calculates
2 it. Normally PRAs don't get down to the level of
3 things like gap release, release from the other parts
4 of the circuit that aren't core damage. And so this
5 tells me that the PRA ought to deal with those things
6 also if you have an FC criteria that goes down to
7 those levels.
8 So, it does provide a useful insight in my
9 mind.
10 MR. KING: Yes. And I guess if you look
11 at a sodium reactor, the sodium water reaction is in
12 a nonradioactive part of the plant. The intermediate
13 loop versus the steam generator.
14 CHAIRMAN KRESS: And also the --
15 MR. KING: So a QHO isn't going to help
16 you there.
17 CHAIRMAN KRESS: I also include this that
18 you have to deal with all sorts of fuel coolant
19 interactions like steam explosions.
20 MR. KING: Yes.
21 CHAIRMAN KRESS: And even the molten fuel
22 on the concrete type of thing if it's applicable to
23 your reactor.
24 MS. DROUIN: Okay. We ready to --
25 CHAIRMAN KRESS: Yes, move on.

1 MS. DROUIN: Okay. We're almost finished.
2 We're almost ready to start to really getting to the--
3 CHAIRMAN KRESS: We almost gave you the
4 ten minutes.
5 MS. DROUIN: Okay. This little cartoon
6 here is supposed to say how do we take this initial
7 idea of creating a new set of complete regulations
8 that from the beginning are risk-derived and
9 performance based. And that can apply to any reactor
10 technology. You know, coming in and start writing
11 these regulations, how do we get there, how do we know
12 what to write.
13 So what the framework was supposed to do
14 was to provide that process of how we go from this
15 idea to actually creating these set of regulations.
16 And we thought the process needs to define a goal, and
17 at least define the guidelines and criteria for
18 achieving that goal. And then that process has got to
19 deal with completeness.
20 CHAIRMAN KRESS: Is that a Picasso?
21 MS. DROUIN: I'm sorry?
22 CHAIRMAN KRESS: Is that a Picasso on the
23 left?
24 MS. DROUIN: Absolutely. That one
25 viewgraph --

1 MEMBER POWERS: That's a Drouin. And in
2 20 years it will be valuable beyond price.
3 MEMBER WALLIS: So when you use the word
4 "goal," you mean something you actually intend to
5 achieve by imposing various guidelines and criteria?
6 MS. DROUIN: Yes.
7 MEMBER WALLIS: It's not the sort of goal
8 that's talked about today where it's something that we
9 try to get close to if we could. It's a real thing
10 you're trying to do?
11 MS. DROUIN: Right.
12 MEMBER WALLIS: It's a measure of
13 performance?
14 MS. DROUIN: Right. And that's what we're
15 trying to show here. And so this process that's in
16 the framework was let's define the goal, let's define
17 the structure to identify the requirements, then let's
18 define the guidelines and criteria to meet that
19 overall goal within this structure. And then we do
20 what we call you turn the crank where you implement
21 all of this and out comes the requirements.
22 MEMBER WALLIS: So this goal --So that's
23 what's shown across that top.
24 MEMBER WALLIS: -- to protect the public
25 health and safety, you're going to very clearly tell

1 us what the measure of performance is there?

2 MS. DROUIN: Right. And that's where you

3 come in and get into our level of safety. What is

4 that level of safety we need to achieve to protect the

5 public health and safety. And then what are those

6 protect -- we called them protective strategies --

7 MEMBER WALLIS: Everything then follow

8 from that goal? And once you have this goal, once

9 you've defined your goal in terms of quantitative

10 measure of public health and safety, is it your intent

11 that everything else will follow from that?

12 MS. DROUIN: Basically, yes. Basically.

13 MEMBER WALLIS: Very much a top down type?

14 MS. DROUIN: That's right.

15 MEMBER WALLIS: Not adding things on at

16 the bottom because someone felt like it and so on.

17 MS. DROUIN: No. That's right.

18 Then trying to put the structure of what

19 kind of requirements that you need to ensure the

20 public health and safety, that's where we came up in

21 addressing the completeness is where we came up with

22 these protective strategies. That if you had

23 requirements that would ensure these protective

24 strategies were met,then we felt that we have ensured

25 the public health and safety.

1 And then the next one is coming up with
2 the guidelines. What are the right probabilistic
3 criteria? You know, defense-in-depth, PRA technical
4 acceptability, et cetera. What are those things that
5 you need in looking at each of these protective
6 strategies? And then ultimately then you turn the
7 crack and come out requirements for design maintenance
8 and operation of the plant, whether they're
9 technology-neutral or technology-specific.
10 So that's the process. So in looking at
11 that --
12 MEMBER WALLIS: "Turning the crank" is a
13 very old metaphor. You ought to use something from
14 the electronic age, I think.
15 MS. DROUIN: Well, you're probably
16 accurate. I'm not sure what that one would be,
17 though.
18 MEMBER WALLIS: Well, if you implement
19 some computer program --
20 MS. DROUIN: So the different technical
21 issues that we dealt with in the framework which we're
22 now going to get into that have this round table
23 discussion, you know, the risk-derived probabilistic
24 with a level of safety, with frequency consequence
25 curve, defense-in-depth, PRA technical acceptability

1 and--

2 MEMBER WALLIS: Wait a minute. You're

3 skip--

4 MEMBER POWERS: You want to go over

5 defense-in-depth pretty quickly.

6 MEMBER WALLIS: You're skipping over all

7 of this. Are you going to discuss these in details

8 later --

9 MS. DROUIN: No, no. I'm saying this is

10 now what we're going to get into.

11 MEMBER WALLIS: Okay. Thank you.

12 MEMBER POWERS: All right.

13 MS. DROUIN: So at that point I'm done

14 with my overview.

15 CHAIRMAN KRESS: Good job, Mary.

16 MS. DROUIN: So I kind of wanted to paint

17 the picture up here and put what we're trying to get

18 to.

19 So each of these, for each topic, we only

20 have a couple of viewgraphs to focus on what we think

21 are the key issues. The ACRS is a stakeholder --

22 MEMBER WALLIS: Are you going to get back

23 to these bullets? You've just skipped over each one

24 of these things?

25 MS. DROUIN: Yes. We're starting right

1 now.

2 MEMBER WALLIS: Well, I'm just wondering

3 if what you're going to give us is going to

4 comprehensively address the bullets that you just

5 skipped over, that's all.

6 MS. DROUIN: I think so. Try to.

7 MEMBER WALLIS: Okay. Okay. Thank you.

8 MS. DROUIN: So I don't know Tom how you

9 want to -- you know, it was our understanding to just

10 start walking through the framework and try to put

11 some key viewgraphs, what we thought were key.

12 CHAIRMAN KRESS: I would say, starting

13 with this I have a number of questions or issues with

14 it that I could throw out. And then ask the Committee

15 Members if they also. And then you could respond to

16 these. Would that be a good way to proceed today?

17 MS. DROUIN: Right. And we tried to

18 structure it that way.

19 CHAIRMAN KRESS: Okay. I think that's a

20 good way to do it.

21 So just to get things started and I'll go

22 ahead and throw my comments and issues here. And then

23 turn it over to the rest of the members. If they also

24 have additional comments. And then you can respond to

25 these, okay?

1 MS. DROUIN: Okay.

2 CHAIRMAN KRESS: All right. Let's start
3 with the step wise factors to this curve. There's
4 really no need for it to be step boxed. It could be a
5 straight line. And it could a straight line that's
6 non-risk adverse because that's basically what you
7 have there already. That's item number one.

8 Item number two that I would have about
9 this is when you use it, I would call this an FC curve
10 that's an aid for identifying licensing basis events.
11 It's not a risk acceptance curve. That's a comment.

12 To determine licensing basis events I
13 would agree that you need to talk about types of
14 accidents and frequency ranges, but within those the
15 ones I would select would be the ones that have the
16 maximum product of FC, not maximum frequency or
17 maximum consequences. That's another comment.

18 Another comment I would have with this is
19 it's not good enough by itself because it doesn't
20 summate the risk from all sequences. So I think you do
21 need another FC curve of a different type. And that's
22 that cumulative, that's complimentary cumulative
23 distribution function curve. You do need that. And
24 that should be your final test as to whether this
25 thing in working.

1 And I maintain that you could make such a
2 curve that's the technical equivalent of a CDF and a
3 LERF but would cover the entire range of frequencies
4 and consequences. And what I envision you would need
5 to do would say you select a constant for your FC
6 equal constant on this curve, you select your
7 licensing basis events from that and you about
8 assuring that the design meets those for the licensing
9 basis events. But then you go to the CCDF curve and
10 see if you meet that criteria. If you don't, you go
11 back and iterate. You select a more stringent line
12 for this thing, and make the design -- modify it so it
13 has to meet that until you converge on meeting an
14 appropriate CCDF curve.
15 Now, my last comment on this is I really
16 don't the consequence being dose. And that's because
17 that invokes Level III too much. You have to have
18 some sort of site characteristics. And it's unfair I
19 think to ask a designer, say something like a PBMR, to
20 have a site in mind. Now I realize you can do this 80
21 percent bogus site. But that's not necessary. And what
22 I think the consequence ought to be is radioactive
23 release. I would call it curies, probably.
24 So those are my list of issues and
25 thoughts and comments on this type of curve.

1 And with that I would ask if other Members
2 of the Subcommittee would like to throw in some
3 thoughts that may be different?
4 MEMBER WALLIS: I have a lot of comments.
5 I agree that the CCDF curve is really what
6 measures the impact on the public. This does not
7 measure the impact on the public of the cumulative
8 effect of all the events possible.
9 And this is what people usually mean when
10 they talk about an FC curve. You've introduced
11 something here which is different from usual usage and
12 is liable to be confusing. So I would like to keep FC
13 curve to mean the CCDF versus consequence curve, which
14 is what the Farmer curve and all those things --
15 MEMBER POWERS: Yes. I would call this the
16 licensing basis F curve or something.
17 MEMBER WALLIS: This is a useful screen
18 for looking at accidents to see if you need to go
19 further with them.
20 I agree with my colleague about drawing a
21 straight line.
22 I don't know what you mean by "dose." I
23 mean dose is what's the public consequence of dose?
24 How about number of fatalities?
25 And I don't see how you can cap at some

1 dose. I mean if you have enough release, you might
2 kill a million people. Dose doesn't mean anything in
3 terms of that.
4 CHAIRMAN KRESS: That's why I would use
5 the release of radioactivity.
6 MEMBER WALLIS: Well, there's going to be
7 release. And if you cap it, you're perhaps cutting off
8 the worst possible accident, which is what the public
9 is concerned with most. So I'm concerned about the
10 use of this rather than CCDF curve.
11 I think it's a very useful screen for
12 preliminary looking at whether or not accidents need
13 more attention.
14 CHAIRMAN KRESS: I think it's a good aid
15 for developing accident basing events, yes.
16 MEMBER WALLIS: I think the consequences
17 need to be thought about very carefully. What are the
18 public consequences? Can you record that just as a
19 dose somewhere? Is that a proper measure of
20 consequences?
21 MEMBER BONACA: Yes. What I don't
22 understand here, since you call that a frequency
23 consequence curve, why did you come up with this
24 curve? I mean, my sense was that you're leveraging
25 existing regulation and criteria, right?

1 CHAIRMAN KRESS: Yes, that's another
2 comment I meant to make, by the way, that the
3 particular curve you have is derived so that it's
4 equivalent to the current regulations. And if you're
5 actually using this for this new technology reactors,
6 I don't think that's responsive to the desire to have
7 a higher level of safety for new technology. But if
8 you did what I said where you use it to select the
9 initial license basing event and iterate on an
10 appropriate CCDF curve until you meet the CCDF curve,
11 I think that concern would go away. But I don't like
12 the idea this new technology is made equivalent to
13 current regulations.
14 MEMBER BONACA: Well, I mean I would like
15 to understand more before. Because I've seen a lot of
16 exchange of information.
17 For example, you know the debate has been
18 do you need licensing basis events. And since you
19 have a PRA, you could actually have a living PRA and
20 warnings or whatever, but it seems to me that you
21 chose that because there is a benefit of having some
22 limiting events, then you address deterministically in
23 a way and you anchor operations, tech specs and
24 everything else that happens at the site on those
25 license basing events, which is again similar to what

1 has been done for current generation of plants.

2 I fail to understand the logic behind the

3 use of a curve like this. Which, again, I think it's

4 leveraging whatever has been used in the past as well

5 as this concept of deriving license basing events as

6 limiting and then addressing them deterministically in

7 comparing to this curve.

8 MS. DROUIN: Go ahead.

9 MR. LEHNER: Yes. Let me say a couple of

10 things about the comments, and I'll address what

11 you've said.

12 MEMBER BONACA: Yes. Because I mean I can

13 see the points of my colleagues here, and I would like

14 to understand your point. Because I'm sure you thought

15 yourself a CDF curve could be a continuous curve.

16 MR. LEHNER: Yes. I mean, this is an

17 example of a DCF curve. We're not saying that this is

18 the one and only definitive CDF curve. Well, let's

19 just call a CDF curve now --

20 MEMBER WALLIS: Don't call it that.

21 That's even more confusing.

22 MR. LEHNER: What would you like me to

23 call it?

24 CHAIRMAN KRESS: A licensing basis event

25 selection curve.

1 MR. LEHNER: Okay.

2 MR. KING: The framework calls it

3 frequency consequence curve.

4 CHAIRMAN KRESS: Yes, I know. That's

5 confusing.

6 MEMBER WALLIS: Very confusing.

7 CHAIRMAN KRESS: Well, it is a frequency

8 consequence.

9 MS. DROUIN: It is a frequency curve. It

10 is.

11 MR. LEHNER: Okay. Now why did we

12 choose--

13 MEMBER WALLIS: It's not a frequency

14 curve. You can't integrate it and do anything to

15 measure -- it's just a screen for looking at

16 individual accidents. It's very different from what

17 you mean by frequency and consequence. Frequency

18 means the probability of something happening with a

19 certain consequence. That's not what this is. It's a

20 screen for looking at individual events. It's quite

21 different.

22 You can't look at this and say that the

23 probability of a dose of one is a certain probability

24 on this --

25 MEMBER BONACA: But in your approach

1 you're still planning to integrate --

2 MEMBER WALLIS: No, you're not.

3 MEMBER BONACA: -- all the cities as to

4 get --

5 CHAIRMAN KRESS: Well, they're going to

6 get to that.

7 MEMBER WALLIS: This is not a probability

8 distribution.

9 MEMBER BONACA: No, not from this. I'm not

10 talking about into this curve. But certainly to come

11 up with some magic criteria or figure of merit you'll

12 compare to. It won't be CDF or LERF, it'll be

13 something else. But --

14 CHAIRMAN KRESS: No. I view that curve as

15 a figure of merit term. It's equivalent to the

16 figures of merit.

17 MR. KING: Yes, it's not a cumulative

18 curve.

19 CHAIRMAN KRESS: It's not a cumulative

20 curve. It's --

21 MR. KING: It' ultimately is used for

22 screening.

23 MR. LEHNER: Okay. First of all, why did

24 we pick these points? As you said, we tried to have

25 some basis in the current regulations. Now the

1 current regulations, of course, give you consequence
2 numbers, it don't give you frequency numbers. So what
3 we've done is we've looked at some areas in the
4 current regulations, like Part 50 Appendix I, Part 20,
5 Part 100 and they give you qualitative ideas as to the
6 frequency when these things apply. We then assigned
7 actual frequency ranges. So that's how we constructed
8 the curve.
9 We thought about doing a straight line.
10 You know, you can go either --
11 MS. DROUIN: Can I just? At one time we
12 did have a straight line. I'm sorry. I just have to
13 interject this. It's probably petty of me.
14 MR. LEHNER: Okay.
15 MS. DROUIN: But we got criticized by this
16 group for the straight line and we went to the step.
17 CHAIRMAN KRESS: Oh, surely not.
18 MR. LEHNER: Well, we thought --
19 CHAIRMAN KRESS: What do you do when you
20 decide you're wrong? Do you change you mind?
21 MR. LEHNER: If you go in a step like
22 manner, you still have a basis for each one of these
23 points. If you draw a straight line, someone can say
24 "well, you know, what about these intermediate
25 points?"

1 MEMBER WALLIS: What's the basis for
2 ending it? I mean you mean to say that a dose of .001
3 rem released continuously from a reactor all the time
4 is allowable?
5 MR. LEHNER: No, that's the second thing
6 I wanted to say. This range and up to 100 rem, these
7 are cumulative doses here. Millirem, sorry.
8 MEMBER WALLIS: That's cumulative, though,
9 that's different.
10 MR. LEHNER: Yes, this is cumulative. And
11 it's mentioned in the framework. It was just
12 confusing to put it on the figure. But from here it's
13 cumulative and down 10 to the minus 3, frequency of
14 ten to the minus 3, these are cumulative. The 100
15 millirem here and the 5 millirem here are cumulative
16 doses.
17 Also, the other requirement that the
18 framework had --
19 MEMBER WALLIS: So excuse me. That means
20 that you don't have a consistent axis. And some of
21 these are cumulative and some of them are individual
22 shots?
23 MR. LEHNER: That's correct. The way it's
24 listed in the framework is that this is on a per
25 sequence basis, but then there's an additional

1 requirement that in this range it's not just a single
2 frequency, it's cumulative.
3 MEMBER WALLIS: But the per sequence
4 bothers me. Because by playing with the PRA and
5 changing the number of branches, you can come up with
6 a different number of sequences. You could have a
7 million sequences lying in this region.
8 MR. LEHNER: Right.
9 MEMBER WALLIS: That doesn't tell you
10 anything about the CCDF curve, which is what you
11 really want.
12 CHAIRMAN KRESS: Yes. Well, that's why you
13 need a CCDF in addition to this.
14 Now, I have a problem with this curve. In
15 fact, I view it like figures in merit in the current
16 regulations with design basis accident.
17 I don't care where you put that curve. You
18 can put it anywhere you want to and draw the slope
19 anyway you want to. Select your licensing basis
20 events from that. But it has to meet the CCDF curve.
21 If it doesn't, you change.
22 MR. LEHNER: Well, right now --
23 CHAIRMAN KRESS: And you can do this on a
24 design specific basis.
25 MEMBER BONACA: What is there right now.

1 CHAIRMAN KRESS: Yes.

2 MR. KING: The framework also calls for

3 analysis to meet the QHO.

4 MR. LEHNER: Yes.

5 MR. KING: So when you populate this

6 thing, it still has to meet the --

7 CHAIRMAN KRESS: That also bothers me. I

8 don't like that because --

9 MR. KING: But the CCDF curves buys you

10 more than that, I agree with that.

11 CHAIRMAN KRESS: Yes.

12 MEMBER WALLIS: Well, suppose all the

13 points are clustered around zero here. Does that mean

14 you have no design basis events? All the current

15 points of all your PRA branches end up in a little box

16 way down in the left hand corner, in the left hand

17 bottom corner there. Does that mean you don't have any

18 design basis --

19 CHAIRMAN KRESS: That's a good design.

20 MR. LEHNER: We do specify that you can

21 add design basis accidents based on the designer and

22 the reviewers.

23 MEMBER WALLIS: Oh, that's good. I like

24 that. I like that.

25 MR. LEHNER: Because, you know, there are

1 situations that you come up with where --

2 MEMBER WALLIS: Right. The problem is by

3 manipulating the PRA you can move stuff around in this

4 space.

5 MR. LEHNER: Well, we mentioned that what

6 was termed as consequence we expect to be at the

7 functional level. And you'd have to be at -- for a

8 specific technology, you would have to decide what

9 constitutes a sequence. So you couldn't keep parsing

10 it to reduce the frequency. That's certainly a valid

11 concern.

12 MS. DROUIN: And we did a -- we had a lot

13 of discussion on that. I mean, that was something

14 that, you know, forget about these advanced reactors.

15 It's a problem we have with current reactors when you

16 use a PRA and you don't come in and define pretty

17 precisely what you mean by a sequence. And you do get

18 people cutting it real, real fine.

19 So we recognized that right away and we

20 have attempted to put very prescriptive boundaries of

21 what we mean by that so that you do not get someone

22 slicing it so thin that they meet everything.

23 MEMBER WALLIS: Well, you could say you

24 must have ten DBAs, no matter what. And they've got

25 to be the most significant sequences based on some

1 evaluation.

2 MR. KING: Well, what we say now is you

3 have to have a DBA, at least one DBA in each of the

4 major event categories.

5 MEMBER WALLIS: Right.

6 MR. KING: Reactivity, insertion, coolant

7 leak, you know a cool handling action --

8 CHAIRMAN KRESS: I think that's a good way

9 to do it. Because what you're after is identifying the

10 types of accidents you can have.

11 MR. KING: Right.

12 CHAIRMAN KRESS: And that gets to that.

13 And then you say, all right let's look at the

14 different things that fall in there and see which

15 one's the worst. I would make it the worst FC product

16 in there. But I think that's a good -- the purpose of

17 this is to identify the types of accidents you can

18 have in reactor design, and then selecting from those

19 types some representative of that type so you can call

20 them licensing basis events which has lots of

21 advantages in terms of current regulatory system and

22 how you define SSCs, and how you deal with defense-in-

23 depth and margins. But it has lots of good points in

24 my mind.

25 But, you know, after you do this you're

1 left where you were with the current regulations. You
2 have a presumption that the reactor design is safe.
3 And the only proof of that presumption is going to a
4 CDF or a LEF or a dose or a QHO. So you need to go to
5 that next step. And that's the CCDF curve.
6 MEMBER WALLIS: Will that tell us why you
7 need a licensing basis events at all? Because this is
8 based on selecting -- this is a measure of a safety of
9 the system.
10 CHAIRMAN KRESS: No. It's a license-based
11 event.
12 MEMBER WALLIS: Aren't you going to
13 explain to us why you need licensing bases events?
14 Because I thought the basis of this whole thing was
15 public safety, which is really the CCDF curve.
16 MR. LEHNER: Well, I think one reason for
17 licensing basis events is because we don't want it to
18 be totally risk based. We want to have, as Dr. Bonaca
19 pointed out, we want to select some events which in a
20 sense are bounding events in their particular
21 category. And yet we want to select those events on
22 a more risk-informed or risk-derived basis than is
23 currently done. So I think that's the bottom line of
24 why we want licensing basis events.
25 MEMBER WALLIS: Well, these bounding

1 events come out of the PRA, don't they?

2 CHAIRMAN KRESS: Yes, but --

3 MEMBER BONACA: Yes.

4 MS. DROUIN: If we go back several years

5 when this was first getting started, this was a policy

6 issue that in using a probabilistic approach to this,

7 did we want to in a sense abandon the concept that did

8 we need DBAs. And it was decided way back when that

9 no, we would not --

10 MEMBER WALLIS: I think you ought to

11 revisit that. Because I've thought this quite a bit

12 and I don't really see what you gain by --

13 MEMBER BONACA: I think what you gain, you

14 gain a clear line for the operator, he has a plan.

15 CHAIRMAN KRESS: Yes, for his licensing

16 basis.

17 MEMBER BONACA: He wants to know that he

18 has that line he cannot cross. He puts it in tech

19 specs. And he's tied to specific events he

20 understands, he supports.

21 I mean for example the LOCA today in the

22 environment of a power plant is a central issue. I

23 mean that's always -- you're always referring to the

24 LOCA because the LOCA sets a lot of margins and

25 requirements. So there is a benefit and stability

1 there fore the operator.

2 I have been looking at some comments that

3 were there and trying to understand how would I write

4 a tech spec if I had, for example, variability of

5 information coming in from changes at the power plant

6 that are changing my tech specs, or things of that

7 kind. And I really couldn't figure it out.

8 CHAIRMAN KRESS: Right. Now consider if

9 all you had was the CCDF curve and you required the

10 designer to meet that, then he could meet that very

11 easily with some accident sequences that contributed

12 very little to it. But by this process you make sure

13 he looks at even those type of accidents. That he

14 covers the whole range of it. And to me, that's sort

15 of defense-in-depth concept. You make sure with this

16 he looks at the kinds of accidents that could happen.

17 MR. KING: And he looks at it in a

18 conservative way.

19 CHAIRMAN KRESS: And in a conservative

20 way. So he may very well meet the CCDF curve and

21 those may not contribute much. But at least you've

22 thought about them. And that's --

23 MR. KING: Yes. There's other reasons for

24 all these. Tom is right. The fundamental is we don't

25 want a risk based approach.

1 CHAIRMAN KRESS: Yes.

2 MR. KING: But one of the ground rules
3 going into this is we're not going to change Part 20,
4 Part 100 and Part 51, these other things. But to
5 implement Part 100 and Part 20 you need some sort of
6 design basis events. You know, you need one for Part
7 100 for siting purposes. So show that you meet the
8 limits for normal operations and anticipated
9 operational occurrences, you need to identify what
10 those events are. And this process will do that.

11 And we use it for safety classification
12 and we use it to test the PRA, we use it to put some
13 margin in the design for defense-in-depth. So there's
14 a number of benefits in doing this.

15 CHAIRMAN KRESS: Let's talk about --

16 MS. DROUIN: You know, it got distorted --

17 MEMBER POWERS: I'd worry a little bit
18 that maybe the questions suggest a position on the
19 Committee that's not universal. I'd like to inject a
20 couple of points here.

21 CHAIRMAN KRESS: Good.

22 MEMBER POWERS: First of all, I disagree
23 with some on the Committee that the FC curve needs to
24 be constructed to reflect the Commission's desire that
25 new plants be safer than existing plants. I think the

1 curve's just fine as it is. I think that additional
2 safety can come in other ways than the criteria
3 established by the curve.
4 I agree with Mr. Wallis. I think DBAs are
5 a dangerous concept because you design to the DBAs
6 rather than design to the risk. I'm okay with them
7 identifying types of accidents to look at.
8 I do not --
9 MS. DROUIN: Then, Dana, I'm confused. You
10 don't -- I'm not sure I understand what you just said
11 because I thought you just said that you don't like --
12 MEMBER WALLIS: Because he's agreeing with
13 me, that's the problem.
14 MS. DROUIN: -- like them today, but he
15 liked them.
16 MEMBER POWERS: Say this again.
17 MS. DROUIN: I thought you just
18 contradicted yourself.
19 MEMBER POWERS: No. I said that I don't
20 like the idea of design-basis accidents. I don't mind
21 identifying types of accident, but I don't like the
22 concept of a design-basis accident or a design-basis
23 event.
24 MS. DROUIN: Okay. But --
25 MEMBER POWERS: Because you design to it.

1 And that's what gets us in trouble with DBAs. That's
2 what got us in trouble with the double-ended
3 guillotine pipe break and that's what will get us in
4 trouble here, too.
5 MS. DROUIN: We deliberately did not use
6 the term design-basis accident.
7 MEMBER POWERS: Yes. But you use event,
8 whatever you --
9 MS. DROUIN: But the reason we didn't use
10 that term is because in identifying the licensing
11 basis events and the approach that we used to identify
12 them, we tried to recognize that since they're coming
13 from using your probabilistic criteria to identify
14 them, that they an change over time because your
15 design may change over time.
16 MEMBER POWERS: Fine.
17 MS. DROUIN: And so they may change over
18 time.
19 MEMBER POWERS: But I find it dubious that
20 any of this can be used. I look at the new designs
21 for light water reactors, and they're coming in with
22 CDFs or events that are exceptionally low. And that
23 tells me that the risk is going to be dominated by
24 those things that the PRA treats very poorly: Aging,
25 defects in construction and external events.

1 How are you going to use this to
2 understand the risk of a plant if the PRA simply
3 doesn't treat those things?
4 And finally, I'll just say that if
5 operators need a clear line -- I think it's where you
6 said it -- I don't think the regulatory system needs
7 to set lines for the operator.
8 MEMBER WALLIS: Can I go back to something
9 my colleague said; the things that the PRA treats very
10 poorly? It's not clear to me what in your DBEs is
11 treated any better than is in the PRA. And if the PRA
12 contains all accidents which you've conceived, DBEs
13 are simply a selection of those; what are you going to
14 do with them which is different from what you do with
15 them in the PRA?
16 MEMBER MAYNARD: Just a minute. He's
17 having trouble over there.
18 MEMBER WALLIS: Is he having trouble? Why
19 don't you lean forward more close to --
20 MR. LEHNER: Sorry. I lost my train of
21 thought.
22 What we do with the DBEs is that we add
23 some conservatism to our calculations because we
24 assigned them a consequence and a frequency which is
25 the highest in their group. So it's the actual

1 individual sequence is likely to have a lower
2 consequence or a lower frequency, but we assign a DBE
3 the highest frequency and the conservative assigned
4 frequency --
5 MEMBER WALLIS: So what you do is
6 presumably the analysis of these things in the PRA is
7 as good as it is in your DBE. It's as if you've taken
8 the §50.46 thermal hydraulics and put in the PRA so
9 that we don't have a set of accidents which are
10 analyzed not quite so well. The PRA is comprehensive.
11 And where it needs to be, it does realistic thermal
12 hydraulic analysis, too, which it doesn't do today.
13 If you do that, then it seems to me your
14 DBEs are simply a subset of PRAs in which you
15 arbitrarily set certain probabilities as one instead
16 of something else. It's a sensitivity study. It's a
17 health stream study.
18 MR. LEHNER: Well, we don't necessarily
19 find -- set the probabilities to one. It's not the
20 current --
21 MEMBER WALLIS: It said you looked at the
22 worst case or something.
23 MR. LEHNER: Right.
24 MEMBER WALLIS: The only way you can do
25 that is to sort of change some probability, isn't it?

1 Otherwise it's already in the PRA.

2 MR. LEHNER: It's in the PRA but we see if

3 you can meet that scenario at a -- if the frequency of

4 that scenario is increased, will it still fall within

5 the --

6 MEMBER WALLIS: Okay. The sensitivity

7 study. It's like saying we've got --

8 MR. LEHNER: The sensitivity, yes.

9 MEMBER WALLIS: -- we've got the PRA and

10 it predicts the double-ended guillotine break, forget

11 it. Because the probability of the initiating event

12 is so tiny. What the regulations do now is they say

13 "oh, no we can't do that. We're going to set the

14 probability of an initiating event as one." And then

15 you're going to have to do an analysis which shows you

16 can stand it. It's a sensitivity study --

17 MR. LEHNER: But not to that extreme. Not

18 to that extreme. In other words, we don't set the

19 probability equal to one anywhere. We --

20 MEMBER WALLIS: Do you set it equal to

21 something else?

22 MR. LEHNER: Yes. We set it equal what

23 the sequences in that class, what they're actually --

24 MEMBER WALLIS: Okay. So it's like saying

25 we won't set the double-ending guillotine break at ten

1 to the minus eight. We'll set it at ten to the minus
2 4 because large break LOCAs average out to that.
3 MR. LEHNER: That's an extreme example,
4 but --
5 MEMBER WALLIS: Okay. I think I understand
6 that now. Thank you.
7 MS. DROUIN: I'm concerned with the
8 comment, Dana, that maybe you think it dubious that
9 this can be done because of things that the PRA
10 doesn't treat well. I think some of these things can
11 be treated better in PRA and should be treated better
12 in PRA. There are things that we recognized that if
13 you truly want to go this risk-derived approach, it
14 means how we do PRAs and use them is going to be very
15 different from today. And people have to really
16 understand that. And I don't know that, you know, the
17 community at large, whether it's the regulator or the
18 industry side of the house, understand that to go this
19 risk-derived approach means that what's going to have
20 to go in that PRA is going to be different from today.
21 And that's why we really wanted to use this word
22 "risk-derived," because we're taking a set of
23 regulations that are deterministic base that we look,
24 that we feel confident that we've ensured the public
25 health and safety, et cetera. And now we're going

1 this other way. We're using a lot of the insights
2 from the PRA in a very fundamental way. Not totally
3 based, because we brought in deterministic and we've,
4 I think, gone further in terms of establishing
5 defense-in-depth to make sure we're not risk-based.
6 But we still have the bar, and that really means that
7 you're going to have to raise the bar in terms of what
8 we're going to accept out of these future PRAs.
9 MEMBER POWERS: You haven't even got the
10 technology for doing some of these things. How do you
11 incorporate aging into a PRA? How do you incorporate
12 defects of construction and materials manufacture into
13 a PRA?
14 MS. DROUIN: I would answer that more by
15 saying those would cause me problems if I was going to
16 be absolutely exclusively in making all my decisions
17 based on the PRA. But we're not. And I think we have
18 to remind ourselves, and remind you guys, that we're
19 not making this exclusively based on the PRA.
20 MEMBER POWERS: Yes, but the trouble is I
21 think you're going to be making your decisions based
22 on a PRA that it's just not very useful to you.
23 Because I mean I see these designs, especially for the
24 sodium reactor, in which the equivalent of a core
25 damage frequency is ten to the minus eight for

1 internal events. Practically impossible. It's a big
2 pot of sodium. If you knock a hole in the pot, it
3 drops the level of sodium about 6". You know, from
4 internal events it's just nothing.
5 What's going to dominate this is going to
6 be external events or we're just not building it
7 right.
8 MEMBER WALLIS: Or maybe human errors.
9 MS. DROUIN: Would I interpret --
10 MEMBER POWERS: And then you get into the
11 -- I mean, the way they're designing it they're
12 saying, "Okay. If we have an event, the operators can
13 go home, spend the weekend, get to know the family and
14 kids and whatnot, and come back on Monday morning and
15 we'll handle this thing." And so what's going to
16 happen, it's going to be dominated by human errors of
17 commission that they can treat at all. And so you're
18 dealing with PRA that becomes as much as a fiction as
19 the double-ended guillotine pipe break.
20 MS. DROUIN: I really don't agree with
21 you. We can get into that debate on the specifics of
22 that at another time.
23 But if I translate what I think you're
24 saying, and I want to make sure I understand what
25 you're saying, is that if I take what you said to its

1 conclusion, is I hear you saying we should not be
2 using PRA at all in our decision making.
3 MEMBER POWERS: I question how you're
4 using it. Not too vigorously, by the way. But I
5 think you're neglecting some of the real advantages of
6 the PRA and looking at what components and systems
7 achieve safety for you. And you're looking at these
8 end points, the CDFs, the LERF equivalence and things
9 like that rather than the risk-achievement, risk-
10 reduction.
11 MS. DROUIN: Well, we're going to get to
12 there. Because we're doing that, too. We're using
13 the risk insights to help us on our safety
14 classification looking at, you know what are those
15 systems and components that are what --
16 MEMBER WALLIS: I would think that you
17 would use the PRA, too. It's a model plant.
18 MS. DROUIN: We just haven't gotten to
19 that part of the discussion.
20 MEMBER WALLIS: It's a model of the plant
21 and consequences of events. You could look at some of
22 Dana's errors of commission and suppose he operated at
23 something really foolish or misguided, you know so
24 follow it through and look at the consequences of it.
25 You've got a model for the plant as well

1 as just some risk evaluations.

2 MR. KING: The problems you're bringing up

3 exist in today's regulations.

4 MEMBER WALLIS: Right.

5 MR. KING: It's not unique to using PRA.

6 MEMBER WALLIS: Why don't you look at your

7 PRA and say suppose we make this probability of an

8 operator doing something foolish one. What happens?

9 You do that all the time, don't you?

10 MR. KING: Yes, you can do that.

11 MEMBER WALLIS: Right.

12 MR. KING: Yes. But I think we're using

13 defense-in-depth to try to take care of these

14 completeness. Because that's the main reason we've

15 got the defense-in-depth principles in here. And you

16 can quibble with whether we've got enough, but they're

17 in there to try and address this once you bring it up.

18 MEMBER WALLIS: The problem is how do you

19 put in everything that you need to put into it? If

20 you put in everything that effects the safety of the

21 plant, then presumably you've covered everything.

22 You're including Dana's problems. You've put in

23 aging, the PRA changes because of aging, presumably,

24 year-to-year or day-to-day if you can model it

25 properly.

1 MR. LEHNER: I mean, just to cover it
2 further on the use of the PRA, I mean I think as we
3 say elsewhere in the framework, I mean especially for
4 these new technologies the PRA certainly is a tool for
5 trying to discover new threats and combinations that
6 you wouldn't have thought so, and it's a very
7 systematic way of looking for unique accident
8 situations.
9 And also, you know we talked before about
10 perhaps you have such a good design that all your DBEs
11 show zero consequences. I mean, you could still
12 select the design or a licensing basis event. What
13 you would do is you would then select an event that
14 tests the design feature, the least of the zero
15 consequences, and you could use that to see what would
16 happen if that particular design feature which you're
17 so relying on to get those zero consequences didn't
18 work as the designer expected. I mean, that would
19 certainly be an important use.
20 MEMBER MAYNARD: I've got just a couple of
21 comments.
22 First of all, on the graph I could care
23 less whether it's a straight line or a stair step. I
24 personally like the stair step a little better because
25 it's a way to tie it together in a way that makes

1 sense. So I personally like the stair step better,
2 but if you want to make it a straight line, that's
3 fine.
4 I do like the idea of not relying totally
5 on the PRA. And I like of concept of I don't care
6 whether we call it DBAs, licensing basis events or
7 whether we use to pick sequences. I think it's going
8 to be important that we use this to be able to pick
9 some of the things that are going to ultimately be
10 needed to establish procedures and processes and stuff
11 to be used in the plant.
12 I'd hate to get in a situation where
13 basically every decision to have to plug in a decision
14 or procedure change into a PRA to see if you can do it
15 whether or not. You're going to have to establish some
16 procedures and processes in the plant. And whether
17 that's based on a DBA or licensing event or whether
18 it's sequences that come out of this, there is going
19 to have to be some selected rather than just have kind
20 of an infinite thing.
21 So I think I'm not in disagreement with
22 your approach there. And I think we could probably
23 debate whether what we call them and how many of that
24 them we have stuff, but I believe that we still are
25 going to end up some licensing basis events, or at

1 least licensing basis sequences that have to be
2 reviewed and approved there.
3 MS. DROUIN: Yes. I mean one of the things
4 that we did not have a viewgraph on, and maybe during
5 the break I'll make a viewgraph of it. Because you
6 know right now in looking at this probabilistic
7 approach and looking at these curves and everything
8 where we're going to the next slides, is you know the
9 selection of what we call these licensing base events.
10 And I said at some way in the past when we were first
11 -- we had quite a bit of discussion on whether or not
12 we should abandon the concept of a DBA, and it was
13 decided not to. Good, bad or indifferent that was the
14 decision.
15 In getting to --
16 MEMBER WALLIS: Did you follow it through
17 what would happen if you did abandon it and what would
18 things look like?
19 MS. DROUIN: Well, we had quite a bit of
20 discussion with this Committee. And not to nitpick
21 again, but the Committee also agreed that we shouldn't
22 abandon the idea of DBA.
23 MEMBER WALLIS: I think rather than set --
24 MEMBER POWERS: Well make a decision on
25 the Committee, did not agree --

1 MEMBER WALLIS: Yes, I agree with him. I
2 don't see that you have to have DBAs. I think they
3 need to be justified. And you have to look at a
4 situation where you don't have DBAs, what are you
5 giving up and then justify why you have to have the
6 DBAs.
7 To make a decision up front that you've
8 got to them I think is false.
9 CHAIRMAN KRESS: I am on the other camp.
10 I think you need the DBAs as a defense-in-depth
11 concept. You've got to look at all accident types.
12 And this allows you to look at those that are not very
13 risk significant. And at least have some way to
14 incorporate margins. I presumed what you would do is
15 treat this like figures of merit and for your license
16 basing events you would have either conservative ways
17 to calculate each one, which is separate from the PRA.
18 You would have the conservative methods to calculate
19 each design-basis or LBE. And if it were going to
20 best estimate, you might even specify an uncertainty
21 with 95 percent there. So it gives you margins, it
22 gives you defense-in-depth and you can go to the CCDF
23 curve, just as a check to see that you also have
24 appropriate risk. Because that sums them up. And you
25 can use some defense-in-depth as a CCDF curve because

1 you can specify that it has to be met at some level of
2 confidence.
3 MEMBER WALLIS: Tom, but you said it's
4 going to be separate from the PRA. But if the PRA is
5 good, as good an analysis of the event as you need,
6 why do you need to have a separate event, separate
7 analysis of that event?
8 CHAIRMAN KRESS: I don't think it's going
9 to be.
10 MEMBER WALLIS: I mean if the --
11 CHAIRMAN KRESS: I think you need to
12 design--
13 MEMBER WALLIS: The current --
14 CHAIRMAN KRESS: Do it like design-basis
15 events.
16 MEMBER WALLIS: The thermal hydraulic
17 analysis is the same in the PRA as it is in your DBA.
18 MEMBER APOSTOLAKIS: But you can't have
19 thermal hydraulic analysis for 10,000 sequences.
20 CHAIRMAN KRESS: That's right.
21 MEMBER WALLIS: That's it. You see, that's
22 it. It's unyielding. That's the problem.
23 MEMBER APOSTOLAKIS: That's the
24 practical--
25 CHAIRMAN KRESS: Oh, yes.

1 MEMBER APOSTOLAKIS: So you are defining--

2 CHAIRMAN KRESS: I'm talking about you

3 have to do this outside the PRA.

4 MEMBER APOSTOLAKIS: You are defining

5 bounding sequences for selected intervals. That's

6 really what it is.

7 CHAIRMAN KRESS: Right. Right.

8 MEMBER WALLIS: But I don't think you

9 should have an analysis which is somehow completely

10 separate from the PRA --

11 CHAIRMAN KRESS: No, no, no.

12 MEMBER WALLIS: It would have to go with

13 it. That doesn't make any sense.

14 MEMBER APOSTOLAKIS: Yes. The so called

15 acceptance criteria, it seems to me, should not be

16 applied here.

17 MEMBER WALLIS: No.

18 MEMBER APOSTOLAKIS: At least at the

19 beginning.

20 MEMBER ABDEL-KHALIK: I mean I view this

21 graph as a way of identifying those limiting events

22 and saying that, okay, we're going to do the detailed

23 analysis for those. At the end of the day when you do

24 the integration and find out what the cumulative risk

25 is, we're also saying that regardless of what the

1 cumulative risk will be, we will not accept a plant
2 design in which events of relatively high consequences
3 would have probabilities exceeding a certain value.
4 CHAIRMAN KRESS: And you have to beat both
5 curves.
6 MEMBER ABDEL-KHALIK: Right. And
7 therefore, I like the idea that this graph is sort of
8 tied into current regulations, just my colleague here
9 say. The problem I have with this is that it does not
10 separate design acceptance from site acceptance.
11 CHAIRMAN KRESS: Oh, I have a problem with
12 that, too. I think those ought to be separate.
13 MEMBER ABDEL-KHALIK: And what my
14 colleague suggested, you know changing the abscissa on
15 this curve to something other than dose, for example
16 curie, I have some difficulty with how one would go
17 about implementing that. Because, you know, a curie
18 of tritium is not the same as a curie of polonium-210.
19 And therefore, it would be very difficult to have a
20 graph where this is purely a design related graph.
21 Somehow you have to tie it to a quantitative measure
22 whether it's rem or man-rem. And if that is the case,
23 then it would seem more logical to sort of forget
24 about having a purely --
25 CHAIRMAN KRESS: I agree that all curies

1 are not the same.

2 MEMBER ABDEL-KHALIK: Correct.

3 CHAIRMAN KRESS: But what I had in mind

4 there was there such a thing as a teddy, and this

5 applies to dose. But what it does is corrects the

6 dose due to different isotopes, the type dose. I think

7 you can back that out and say all right, so many

8 curies of this type isotope and this, and this and

9 this one. You could actually have a selected set of

10 fission products and actonides that have a weighting

11 factor to them for this. And it's not straight

12 forward that it goes straight to curies.

13 MEMBER ABDEL-KHALIK: But you can get

14 around that problem by, you know, with sort of

15 thoughtful preparation coming up with a standard site

16 against what you --

17 CHAIRMAN KRESS: Well, that's what they

18 intend to o.

19 MEMBER ABDEL-KHALIK: I believe what

20 you're suggesting, Tom, was done at the waste disposal

21 arena.

22 CHAIRMAN KRESS: I think you're right.

23 MEMBER ABDEL-KHALIK: Where they define

24 this arc which is a weighted average of various

25 nuclides and so on.

1 CHAIRMAN KRESS: Yes. It certainly can be
2 done.
3 MEMBER APOSTOLAKIS: Are you discussing
4 the overall approach or specific curve?
5 CHAIRMAN KRESS: We're starting from this
6 curve, George, and everybody's throwing out their
7 concerns and issues with it. And if you have them,
8 you're welcome to jump in right now.
9 MEMBER APOSTOLAKIS: I thought you
10 advocated a three region approach. Tolerable, you
11 know, unacceptable and acceptable. How is that
12 reflected on this curve?
13 MR. LEHNER: The three region approach I
14 think that you're referring to is the level of safety
15 question.
16 MEMBER APOSTOLAKIS: Yes.
17 MS. DROUIN: No, no, no. It's the frequent
18 and infrequent.
19 MR. LEHNER: Or is it the infrequent,
20 frequent and rare, is that what you're --
21 MEMBER APOSTOLAKIS: No. He's talking
22 about the QHO.
23 MR. LEHNER: The level of safety.
24 MEMBER APOSTOLAKIS: Yes, level of safety.
25 MR. LEHNER: That's what I thought, yes.

1 Okay. Well, I mean we're saying that you
2 have to be in the least region, the desirable region,
3 I guess,
4 MEMBER APOSTOLAKIS: Of this acceptable
5 region here, I see only two regions; unacceptable and
6 acceptable. There is no tolerable in between where
7 you would apply cost benefit to reviews.
8 MR. KING: You don't apply cost benefit on
9 initial licensing. When you get back in to making
10 changes after it's licensed, you apply cost benefit.
11 MEMBER APOSTOLAKIS: No. No, you do.
12 Because you can say for example here is the acceptable
13 region. And for one sequence it happens that I am
14 above this line. Then if you have this tolerable
15 region, the licensee or the applicant may argue
16 successfully that it's not worth pushing this down
17 because of the extraordinary cost and the frequency
18 there is tolerable anyway. That's the whole point of
19 this.
20 It's not unacceptable in the sense that
21 you either fix it or we reject your design.
22 MR. KING: Well, he may argue that and he
23 may cost as part of his argument. But we don't have
24 any rule like the backfit rule that applies to initial
25 licensing.

1 MEMBER APOSTOLAKIS: Then you are not
2 using the three region approach, so why are you
3 carrying that?
4 MS. DROUIN: We were not proposing to
5 using the three region approach in identifying the
6 licensing base advance. We were not proposing that.
7 I never have proposed that in terms --
8 MEMBER APOSTOLAKIS: So where are you
9 using it.
10 MR. LEHNER: The three region approach is
11 simply to indicate that the framework aims to develop
12 regulations which will put a new plant into the least
13 risky region, the desirable region. I mean that was
14 the purpose of the three region approach.
15 Now if you were trying to translate that
16 into this FC curve --
17 MEMBER APOSTOLAKIS: That's not an
18 approach, though, John. It's just a philosophical --
19 MS. DROUIN: Yes, I was just going to tell
20 you there was never an approach. We never had a three
21 region approach.
22 MEMBER MAYNARD: I thought that was part
23 of you defense-in-depth on the safety, security and
24 preparedness expectation. That's where --
25 MS. DROUIN: That's right. I mean there

1 was not an approach. What we were saying is that you
2 can look at risk in three regions. You have this
3 region you don't want to be in. You have a region
4 that, you know, tolerable and then you have the
5 desired. And we're saying for the framework we're
6 going to construct a structure that will force you to
7 be in the desirable region.
8 So we never had a thing called a three
9 region approach.
10 MEMBER APOSTOLAKIS: Well, then it should
11 be rewritten. Because this part i sa little
12 misleading. Because it says three regions.
13 MEMBER MAYNARD: Yes. In a status update
14 where you was talking about, again, a part of your
15 safety, security and preparedness expectation for
16 defense-in-depth is --
17 MS. DROUIN: No. I am aware of the figure.
18 And if you understood that's what we were doing, then
19 that was bad communication on our part. I mean,
20 you're talking about this figure right here.
21 MEMBER APOSTOLAKIS: Yes.
22 MR. LEHNER: I think it was entitled
23 "Three Region Approach."
24 MS. DROUIN: Oh, no. It's not my hand.
25 MEMBER APOSTOLAKIS: Wait a minute now.

1 This is a very important point. Because what you have
2 here is you have --
3 MS. DROUIN: We've got this document on a
4 memory stick. We're going to pull it up so we can see
5 some of the stuff.
6 MEMBER APOSTOLAKIS: You have staircase
7 which comes from existing regulations, right?
8 CHAIRMAN KRESS: Right.
9 MEMBER APOSTOLAKIS: So one question might
10 be why, you know, develop it that way. But you can
11 argue against it and say -- no, no, you can argue that
12 this is okay because I can use 95th percentiles and
13 make sure that the new designs will be better.
14 But there is another question here.
15 Presumably since these are deterministic requirements
16 under whatever their limits, Part 100 and so on, the
17 existing plants do comply, don't they?
18 MR. LEHNER: To this curve?
19 MEMBER APOSTOLAKIS: Not to the curve.
20 Well, I guess in some sense to the curve, too. But
21 when you say that this comes EPA such-and-such, don't
22 existing plants meet that?
23 MR. LEHNER: I think the existing plants
24 meet this in the way it's characterized in the current
25 regulations. What we've done here is we've taken the

1 consequences, if you like, and the current regulations
2 they are qualitatively discussed. We've assigned
3 certain frequencies to them.
4 MEMBER APOSTOLAKIS: Right. Right.
5 MR. LEHNER: That's --
6 MEMBER APOSTOLAKIS: But presumably the
7 existing plants even in a qualitative sense in one
8 dimension meet the requirements of guarding what is
9 triggering and what is AOs and all that stuff, isn't
10 it, in Part 100 or Part 50.34?
11 MR. LEHNER: Not the Part 100 we do.
12 MEMBER APOSTOLAKIS: No.
13 MR. KING: Beyond that there are no
14 requirements. This is new beyond the Part 100 dose.
15 MEMBER APOSTOLAKIS: The thing that is
16 really of interest here is that you have a number of--
17 we have the goal of ten to the minus four for how much
18 frequency. A number of the plants even though they
19 meet the deterministic regulations, violate that
20 power. In fact, a significant number and we tolerate
21 it. So de facto there is a tolerable region in risk--
22 MEMBER WALLIS: Well, we asked Mary about
23 that earlier, and she said the goals are to be met.
24 We asked that --
25 MEMBER APOSTOLAKIS: Well, and that's what

1 my question is here. I mean what do you do? The fact
2 that the agency does have a tolerate region in risk.
3 MEMBER WALLIS: A kind of grandfather
4 clause. I think she's saying in the future they're
5 going to have to meet the goals, isn't that what you
6 said to me?
7 MEMBER APOSTOLAKIS: Until one design does
8 not. I mean, come on. And then there will again be
9 some exemption, some arm waving that come on, he
10 really doesn't matter. Does you really believe it's
11 ten to the minus six? It could be, you know, a little
12 less. It happens all the time.
13 MR. KING: Yes, but NRC has no regulation
14 on CDF or any other risk --
15 MEMBER APOSTOLAKIS: It's a goal, though.
16 MR. KING: It's a goal? But the --
17 MEMBER APOSTOLAKIS: Yours is a goal. Is
18 it a criteria?
19 MR. KING: These would be regulations if
20 you go forward and do a rulemaking.
21 MEMBER APOSTOLAKIS: Criteria. These will
22 be criteria. You have to demonstrate you meet them?
23 MEMBER WALLIS: Yes.
24 CHAIRMAN KRESS: Yes.
25 MR. KING: In terms of 95th percentiles?

1 CHAIRMAN KRESS: Well, that hasn't been
2 spoken about now.
3 MEMBER APOSTOLAKIS: So when did we start
4 dreaming?
5 MEMBER ABDEL-KHALIK: There's no mean
6 value.
7 MEMBER APOSTOLAKIS: This is absurd. This
8 is completely absurd.
9 MS. DROUIN: Explain it.
10 MEMBER APOSTOLAKIS: I mean you can give
11 me your 95th, I can give you my 95th and we debate
12 forever what the right number is.
13 CHAIRMAN KRESS: No, no. This is a PRA.
14 This is like the design basis --
15 MEMBER APOSTOLAKIS: I just -- the
16 practicality of requiring that something like this
17 will be implemented on the basis of 95th percentiles
18 or means and that it will be a stringent criteria is
19 just not there.
20 MEMBER WALLIS: But it's even worse if
21 everything is debatable the way you describe it.
22 CHAIRMAN KRESS: Look, George, I think
23 you're making --
24 MEMBER APOSTOLAKIS: But day one we said
25 these lines are not bright, right? From day one, 1977

1 when we starting thinking about this, the lines are
2 not bright. Now we make them bright.
3 CHAIRMAN KRESS: George, think of this
4 line as the equivalent of the figures of merit in the
5 current design basis accident. It's the technical
6 equivalent of those figures of merit. They are bright
7 lines. They are not --
8 MEMBER APOSTOLAKIS: They are?
9 CHAIRMAN KRESS: Yes, they are not
10 tolerable --
11 MEMBER SHACK: 2200 F.
12 CHAIRMAN KRESS: They're bright lines.
13 MEMBER APOSTOLAKIS: And what I'm saying
14 is that in risk space --
15 CHAIRMAN KRESS: This is not in risk
16 space.
17 MEMBER APOSTOLAKIS: It's not?
18 CHAIRMAN KRESS: No.
19 MEMBER APOSTOLAKIS: Well there's
20 frequencies there.
21 CHAIRMAN KRESS: What you have to do is
22 estimate the frequency of these things.
23 MEMBER APOSTOLAKIS: Yes.
24 CHAIRMAN KRESS: That only --
25 MEMBER APOSTOLAKIS: And that is subject

1 to uncertainties. This is subject to all sorts of
2 things. And --
3 CHAIRMAN KRESS: Yes, but it's like design
4 basis accident. You specify that the calculations for
5 frequency and the calculations in this case dose, but
6 I would have curies, are to be done either in a very
7 conservative way or you have to do an uncertainty
8 analysis and then specify some level of --
9 MEMBER APOSTOLAKIS: Like the 95th
10 percentile --
11 CHAIRMAN KRESS: Like you do in the best
12 estimate calculation for LOCAs. Now they only require
13 you to -- they don't require you to calculate the
14 frequency there.
15 MEMBER APOSTOLAKIS: I don't believe
16 that's going to work. Think they should be --
17 MEMBER WALLIS: But George, why shouldn't
18 you apply the same criteria of acceptable to frequency
19 as you do to thermal hydraulic calculations? Why is
20 it in some other world that we have to prevaricate
21 about it all the time.
22 MEMBER APOSTOLAKIS: These frequencies
23 have a hell of a lot of judgment in them. And if you
24 specify a -- I mean, ultimately risk-informed means
25 that you are forming an opinion about the whole thing

1 by looking at a lot of things.

2 MEMBER WALLIS: Well, there's judgment

3 about using a heat transfer correlation. And there's

4 all kinds of those things, too.

5 MEMBER APOSTOLAKIS: Well, because you

6 guys live in a dream world. You never put uncertainty

7 on these things.

8 MR. LEHNER: And you don't want to go into

9 that, do you?

10 MEMBER APOSTOLAKIS: I don't want to go

11 into it.

12 MEMBER WALLIS: Well, welcome, George.

13 We'll bring you in.

14 MEMBER APOSTOLAKIS: I just don't think

15 it's going to work out. And lots --

16 CHAIRMAN KRESS: How would you select the

17 design basis accident?

18 MEMBER APOSTOLAKIS: It will be risk-

19 informed again.

20 CHAIRMAN KRESS: That is risk-informed.

21 MEMBER APOSTOLAKIS: But I would not

22 demand that the frequency be at the 95th percentile

23 less than this. That's where the tolerability comes

24 into the picture. That if you go -- I mean, it's

25 stated beautifully in 1174. As you approach the line,

1 there will be increased management attention, period.
2 There's a warning. But very wisely they're not telling
3 you what that management attention will be. But the
4 message is clear.
5 We're going to debate this. We're going
6 to scrutinize it. You have to convince us.
7 CHAIRMAN KRESS: Well, my approach to deal
8 with that, George, is you select their licensing base
9 events and your method of determining your figures,
10 whether they meet the figures, they may or may not,
11 and that's conservative or uncertainty. Then you go
12 to the CCDF curve and then you acquire a very good PRA
13 with uncertainty analysis and you say you have to meet
14 that CCDF at some level of confidence.
15 MEMBER APOSTOLAKIS: And again, even--
16 CHAIRMAN KRESS: That deals I think with--
17 MEMBER APOSTOLAKIS: But even that
18 comparison will have to be in a judgmental way.
19 CHAIRMAN KRESS: Well, anytime --
20 MEMBER APOSTOLAKIS: I mean it's never one
21 thing. It's never the PRA that convinces --
22 CHAIRMAN KRESS: Anytime you deal with
23 acceptance criteria, you're going to have to bring in
24 a level judgment. I mean there's no technical to say
25 this acceptance criteria is the right one. It's a

1 judgment. It's a --

2 MEMBER APOSTOLAKIS: It should be stated

3 in such a way that there will be some latitude in

4 making the decision.

5 MEMBER WALLIS: We all follow that. Try

6 telling that to a policeman when you're speeding on a

7 highway, huh.

8 MEMBER APOSTOLAKIS: Speeding on a highway

9 does not involve polling experts to tell me the

10 frequency of my brakes. I either measurement or I

11 don't.

12 MEMBER POWERS: I don't understand quite,

13 George. If I came back in and told you that my

14 frequency of small break LOCA here is one. It's

15 enough.

16 MEMBER APOSTOLAKIS: Yes. I say no.

17 MEMBER POWERS: If you tell you and said

18 it was .1, you'd say no. Those are bright lines. Why

19 can't I set it at ten to the minus four a bright line?

20 MEMBER APOSTOLAKIS: Because then I will

21 say maybe

22 MEMBER POWERS: Oh.

23 MEMBER APOSTOLAKIS: And when I say maybe

24 the we have a problem.

25 MEMBER POWERS: Okay. So it's real easy to

1 set this, Mary. Just interrogate George. When he says
2 maybe, then go one little decade higher than that,
3 then that's a bright line.
4 MEMBER APOSTOLAKIS: I really don't
5 understand. First of all, I don't --
6 MS. DROUIN: I'm confused here. And the
7 reason I'm confused is that when you Reg. Guide 1174,
8 Reg. Guide 1117 there's a decision process if you want
9 to go change your licensing basis. And so in changing
10 it you want to, of course, look at what's going to be
11 the change in risk. You want to look at the delta and
12 then also you want to meet your thresholds. And
13 having those as not bright lines under that context
14 makes sense because you're trying to change something
15 that you already have there.
16 What we're doing here, we're not trying to
17 change something. What we're trying to do here is
18 decide now it's two different debates whether or not
19 you even have a concept of a DBA or a licensing base
20 event. But given that you want to maintain that
21 concept, then we're saying how do you use your risk
22 information to help you select those.
23 So what was being done in 1174, I mean how
24 do you have management attention that -- you know,
25 it's just a different concept. It doesn't --

1 CHAIRMAN KRESS: It doesn't make sense.

2 MEMBER POWERS: It doesn't make sense.

3 MEMBER APOSTOLAKIS: You may not be able

4 in a design to demonstrate that when the number of

5 consequences is ten, the frequency is what you wanted.

6 It may be a little higher due to uncertainties.

7 You're talking about new designs. There

8 are crazy ideas of using microturbines for extra

9 power, of using nitrogen accumulators, of using squib

10 valves; all sorts of uncertainties.

11 MS. DROUIN: That's right.

12 MEMBER APOSTOLAKIS: And you're going to

13 tell them show me that the reliability is this? This

14 is not realistic.

15 MS. DROUIN: I disagree. I think that

16 when you're dealing with new designs because you have

17 these uncertainties there, that to use an approach

18 that you're coming in at your initial design stage

19 using your PRA to help you select those. And now as

20 you move from design state to construction and

21 operation, you're operating the plant. Now you're

22 being forced as you manage that plant as the licensee

23 manages his plant and does the things that he has to

24 be doing. And as we oversee it. That are they truly

25 meeting the conditions under which they were designed?

1 So if the risk starts risk, they have a choice. You
2 know, they go mega modification or all of a sudden
3 they've got a new licensing base in there that they've
4 got to now meet.
5 So this --
6 MEMBER APOSTOLAKIS: This is very
7 idealistic. I think the best --
8 MS. DROUIN: I don't think it's idealistic
9 at all.
10 MEMBER APOSTOLAKIS: -- is to have a
11 pilot.
12 MS. DROUIN: Now, we do agree that you
13 should pilot this stuff. Absolutely should.
14 MEMBER APOSTOLAKIS: But this is a
15 critical thing in my opinion. You're going now the
16 direction of risk-based --
17 MEMBER ABDEL-KHALIK: But I think from a
18 designer's perspective I like the idea that this line
19 is a bright line. If I was a designer, you know,
20 starting the process I go through, figure out some
21 sequences and I find out that I'm in the unacceptable
22 region, I say "uh-oh, I'd better go back and change
23 the design" before proceeding further.
24 MEMBER APOSTOLAKIS: It is not as simple
25 as that, Said. You have reactors that have new ideas

1 in them. You know, gas cooled fast reactors, you have
2 other things. You know, GNEP now is coming along.
3 There are questions about common cause failures. I
4 have designers in my place, you know, getting very
5 frustrated when I tell them beta cannot be less than
6 that. And they say "Tell me what to do." There is a
7 lot of uncertainty. Then they propose these
8 innovative things like, you know, micro-turbines have
9 not been used yet. And then I hit then back and I say
10 how about the NRC staff, what are they going to say
11 about this? You know, then they say "Well, then I'm
12 going to use it." And it's not one sequence. It
13 effects a lot of the PRA. It's not just one sequence
14 where you say, okay, you know add something as a
15 defense-in-depth and reduce the --
16 MEMBER WALLIS: But, George, if you have
17 a fuzzy area it doesn't help. Because then it means
18 there's a tension. Well, it depends on NRC person you
19 talk to. It depends on who happens to be the manager
20 this week and all that. That's no way to regulate.
21 MEMBER APOSTOLAKIS: The designer will do
22 his or best to make sure the bulk of the distribution
23 is way below. But if you force a guy to start arguing
24 about --
25 MEMBER WALLIS: That means 99 percentile?

1 MEMBER APOSTOLAKIS: -- percentiles --

2 MEMBER WALLIS: Way below his 99th

3 percentile? What is way below?

4 MEMBER APOSTOLAKIS: That's a judgment

5 thing. That's my po;int.

6 MEMBER WALLIS: Oh.

7 MR. KING: But, George, the problems

8 you're talking about don't exist whether you use this

9 approach or some other licensing approach.

10 MEMBER APOSTOLAKIS: Or you use this

11 approach and you don't claim that this is a criteria.

12 MR. KING: But this approach takes a

13 comprehensive way to try and look at all the sequences

14 and estimate the answer using more information than

15 the old way.

16 MEMBER APOSTOLAKIS: I never doubted that.

17 All I'm saying is using them as bright lines is not

18 realistically.

19 MEMBER MAYNARD: But I think the

20 regulatory process it is a legal process. And I think

21 bright lines have to be set. There has to be

22 provisions for that how can you move around that, but

23 that has to be the exception rather than the rule

24 because it is a legal process.

25 MEMBER APOSTOLAKIS: Think of the

1 practicality of implementing this.

2 MEMBER CORRADINI: I'm late and so you've

3 probably answered this. So I read this whole document

4 and I kept on tripping over the word risk-derived.

5 And so, all right --

6 MS. DROUIN: You did miss that part, but

7 that's okay.

8 MEMBER CORRADINI: Okay. But I

9 interpreted it is that once you do this process the

10 sequences that you choose are the ones that the

11 designer will be held accountable for the design, not

12 the methodology to choose the sequences. Am I

13 misinformed?

14 MS. DROUIN: No.

15 MEMBER CORRADINI: In other words, I'm

16 going to take two practical examples. Long ago Clinch

17 River was licensed, kind of, right? And Fort St.

18 Vrain was licensed for sure. If you were to apply

19 this methodology, would you have come up with

20 different accident sequences to regulate on for those

21 two real plants? If the answer to that is yes, I'd be

22 curious what they are. If the answer is no, then you

23 essentially are taking a technique and using it very

24 properly so if you get another unusual design beyond

25 those two. But I guess that would be, my way is

1 empirical.

2 You have two plants back in the '70s that

3 you licensed. What if you applied this to those two

4 plants, what would you get out of it?

5 MS. DROUIN: Let me answer it. I think I'm

6 going to answer it, but a different way.

7 If you go to Appendix E of the framework

8 document, we did do a test case. We didn't apply it

9 to Clinch River. We applied it to a current LWR. And

10 if you applied this where we had a PRA available what

11 would come up. And we did identify some events that

12 were not addressed currently they would have to

13 address.

14 It's been a while since I've looked at

15 this Appendix, and I'm going to let Bruce over there

16 who was our primary person on the team that did the

17 test case for us.

18 MR. MRORCA: This is Bruce Mrorca from

19 ISL.

20 That test case did show consistency to

21 some degree between the current design basis events

22 and those that were derived from the framework

23 processes. But there were also differences. Clearly

24 some of the frequency consequence curve criteria were

25 not met. There were a few events that did not meet

1 the defense-in-depth criteria. But there were also
2 additional events that were identified that would be
3 out of scope into today's framework like station
4 blackout or ATWS events that would be identified as
5 licensing basis events.
6 So you saw both a combination of
7 additional licensing basis events that were of high
8 consequence that would have been excluded because of
9 common cause considerations or essentially using a
10 single failure of the original design basis events.
11 And you saw those included as licensing basis events.
12 And you saw some rare events like large break LOCA
13 with a simultaneous loss of off site power being
14 excluded because those have such a low frequency that
15 they would not have shown up as a licensing basis
16 event or design basis event.
17 So there is a combination of new and
18 reduced in that mix.
19 MEMBER CORRADINI: So then I started with
20 my question and maybe I'm incorrect. So then if you
21 had done this exercise with the light water reactors,
22 and let's say this is a light water reactor Prime,
23 it's one of the new ones, would you then specify the
24 accidents for the designer or would you specify the
25 process?

1 MS. DROUIN: The process.

2 MEMBER CORRADINI: So this is not using
3 the internal process to pick what you want to
4 deterministically design to? Rather it's actually
5 going to allow them to say "Well I have these ten."
6 And you'd say, "Wait a minute. I don't like those ten.
7 I have these nine plus two more." You see my concern.

8 MS. DROUIN: Right.

9 MEMBER APOSTOLAKIS: I suspect the
10 applicant will have to demonstrate that they meet this
11 curve.

12 MEMBER CORRADINI: Right.

13 MEMBER APOSTOLAKIS: Here is my design,
14 these are the consequences.

15 MEMBER SHACK: And I picked these
16 sequences by the process that's been outlined.

17 MEMBER APOSTOLAKIS: But, shall we move
18 on?

19 MS. DROUIN: But recognizing because I do
20 think to me one of the good things about the process,
21 and what I said earlier, is that because they're going
22 to have to maintain that PRA so that if the design
23 changes, you know are they not doing things the way
24 they said would be doing, you know they may now have
25 to come in and new events may now show up.

1 MEMBER CORRADINI: I understand.

2 MS. DROUIN: That they would have to deal

3 with.

4 MEMBER CORRADINI: I understand. Thank

5 you, though.

6 MS. DROUIN: So it accommodates to me the

7 uncertainty and the newness of these designs so it

8 doesn't come in with this idea that here's your events

9 for all time. These are it.

10 MEMBER APOSTOLAKIS: Now there is a major

11 issue. What time is it?

12 MEMBER WALLIS: Before we move, are you

13 going move on, George. I want to talk about the axis,

14 the dose axis. You talked about the frequency thing.

15 MEMBER APOSTOLAKIS: I want to talk about

16 the vertical axis.

17 MEMBER WALLIS: Could I talk about the

18 dose axis for a moment?

19 MEMBER APOSTOLAKIS: I think you can.

20 You're chairing.

21 MEMBER WALLIS: This dose you have in mind

22 is at the site boundary, is that right? This is at

23 the site boundary? Just yes or no.

24 MR. LEHNER: No.

25 CHAIRMAN KRESS: Microphone.

1 MEMBER WALLIS: John, microphone.

2 MR. LEHNER: Sorry. It's also a fixed

3 axis in that up to a 100 rem it's the exclusionary of

4 boundary. Beyond that it's one mile from the

5 exclusionary boundary.

6 MEMBER WALLIS: One mile? This is some

7 distance, right?

8 MR. LEHNER: Right.

9 MEMBER WALLIS: Okay. So I will design a

10 reactor which fits in a cooling tower, all right. Fits

11 in a cooling tower. If I have an accident, make sure

12 it's damn energetic. I have some inflammable stuff in

13 there. And if I have an accident, I light off an

14 immense fire, and it's in a chimney, right. And it

15 goes up as a plume. And it's so finely aerosol and it

16 goes up and it lands a 100 miles away. I make damn

17 sure that nothing lands a mile from my plant. All

18 right. Is that an acceptable design?

19 MR. LEHNER: It is today.

20 MEMBER WALLIS: It is today. Well, that is

21 not acceptable --

22 MEMBER MAYNARD: No, I don't believe

23 that's true. I think you have to assume that the

24 plume goes -- you have basically a --

25 MR. MUBAYI: This is Vinod Mubayi from

1 Brookhaven. Let me just comment on that.

2 If it lands a 100 miles away, the dilution

3 factor will take care of the fact of meeting any such

4 curve. Now, if it lands 1½ or 2 miles away, you might

5 have some problems that you had up in licensing

6 Seabrook where people on the beach in Massachusetts

7 were just one and three-quarter mile away. There are

8 those kinds of minor technicalities that apply to very

9 individual sites. But, you know, but that would then

10 be implemented with whatever you're going to site --

11 MEMBER WALLIS: Well, it's your reactor.

12 If you tell me this it at some distance, I can try to

13 design the plume that it's always going to go further

14 than that distance.

15 CHAIRMAN KRESS: It's another reason to

16 use curies --

17 MR. MUBAYI: Well, why would you design a

18 plume to give a dose? You would rather not --

19 MEMBER WALLIS: To meet the regulations.

20 MR. LEHNER: But you also have to meet the

21 safety goals.

22 MEMBER WALLIS: Yes, right.

23 MR. LEHNER: You know, a plume comes down

24 1½ miles away, you're not going to meet the safety

25 goals.

1 MEMBER WALLIS: But you see my point.
2 That just a dose at the site boundary is a pretty weak
3 way of defining --
4 MEMBER MAYNARD: No, I don't believe that
5 today's current requirements allow you to do that. I
6 think you have to assume that they get to that.
7 MR. KING: The reg. guide requires you to
8 assume a ground level plume.
9 MEMBER MAYNARD: Yes.
10 MR. KING: And in --
11 MEMBER WALLIS: Yes, but I designed it so
12 it can't happen.
13 MR. KING: It would probably make sense,
14 we'd do the same thing.
15 MEMBER APOSTOLAKIS: There is another
16 issue here. The impression I get from reading the
17 report is that what is called the frequency up there,
18 which is implied to be the frequency of the dose, is
19 really not the frequency of the dose. It's the
20 frequency of events that do not meet the acceptance
21 criteria, which is very different from the frequency
22 of the dose.
23 MEMBER WALLIS: Very different. We made
24 this point, too. It's a very funny curve.
25 MEMBER APOSTOLAKIS: So for the LBEs, it

1 seems to me, you have to do a complete analysis. Go
2 all the way to the probability of exceeding the
3 regulatory limits on temperature, pressure and so on.
4 And then in the name of defense-in-depth, of course,
5 you can impose margins and so on. But here these are
6 not those frequencies. This is the frequency of
7 having a dose between one and ten rem.
8 There is, in fact, a very small
9 probability that given those frequencies, you will
10 exceed the thing.
11 In other words, the frequencies are the
12 traditional PRA frequencies that reflect only
13 redundancy. They don't reflect the margin that you
14 have. Because in traditional PRA the margin is given
15 to us by Westinghouse, by General Electric. And the
16 PRA guys look at the one out of two, two out of three,
17 one of three and say, "Okay, I don't meet the
18 acceptance criteria that Westinghouse has given." But
19 that doesn't mean that even if you don't meet them all
20 the time, you are lead to a major disaster. Because
21 there is conservatism in those acceptance criteria.
22 So it seems to me the first evaluation of
23 the LBEs should go all the way from the frequencies to
24 the probability, given a certain context of exceeding
25 the regulatory limit, which itself is conservative.

1 So even if you do that, you are still dealing with a
2 conservatism, which I wouldn't touch. And then in
3 applying defense-in-depth you might say "Now, look, I
4 really don't like this probability of exceeding given
5 these conditions." So independently in the name of
6 defense-in-depth I want you to make sure it's such-
7 and-such. And then the frequency will also be handled
8 in a different way.
9 I mean these are real issues when you're
10 trying to design a new system. Okay. These are not
11 theoretical considerations. I mean for existing
12 reactors we're all very pleased -- or happy, not
13 pleased. Happy to accept what General Electric says
14 or Westinghouse, or whatever. But for new reactors it
15 seems to me it's an open field now.
16 CHAIRMAN KRESS: George, I don't
17 understand. I can draw a curve there of perceived
18 versus consequence. It's independent of the curve
19 regulations. Independent of anything. This is just a
20 policy statement.
21 Now, I say I want to use this curve as my
22 guidance in selecting licensing basis events. I don't
23 care -- and the way I'm going to do it is I'm going to
24 also take a PRA and find out were sequences, too, in
25 that curve.

1 MEMBER APOSTOLAKIS: Let me put it in a
2 different way. You can do that, but the designer has
3 a secret weapon now. The margins. So instead of
4 imposing, you know, large margins that say for example
5 you need two of the steam generators if you have
6 those, he reduces that so you only need one.
7 Immediately he has a dramatic impact on the
8 frequencies. Because that part of the margins is not
9 regulated yet.
10 CHAIRMAN KRESS: As long as he stays under
11 the curve. And then --
12 MEMBER APOSTOLAKIS: No, but the curve is
13 incomplete, that's what I'm saying.
14 MEMBER CORRADINI: I don't think I
15 understand that part.
16 MEMBER APOSTOLAKIS: You're losing -- you
17 have an accident sequence, right? It creates a
18 certain conditions. Then the thermal hydraulics guys
19 take over and they calculations. Whether the
20 temperature, for example, or the cladding exceeds 2200
21 degrees, right? Now, that part is usually done
22 independently of the PRA. It's done by the vendor.
23 The vendor comes back and says "In order for this not
24 to be exceeded, here are the acceptance criteria in
25 terms of trains that must work and so on."

1 So the PRA, what we call PRA now is really
2 only an evaluation of those trains working.
3 MEMBER CORRADINI: Yes.
4 MEMBER APOSTOLAKIS: Once you don't meet
5 the acceptance criteria, you say core melt when in
6 fact that's not true. Okay. And what I'm saying is
7 in this kind of an evaluation if we keep that
8 additional definition of frequency, that part that
9 says -- you know, there is a buffer between what
10 really happens in the PRA and it's called acceptance
11 criteria. And I'm saying --
12 MEMBER WALLIS: So the lack of adequate
13 thermal hydraulics in the PRA?
14 MEMBER APOSTOLAKIS: So what I'm saying is
15 they do the frequency calculation and then you do the
16 thermal hydraulic analysis for these selected LBEs.
17 And then you have a clear picture of what is the
18 frequency of exceeding whatever regulatory limits you
19 have. And then you go to defense-in-depth and you
20 say, "Yes, but I don't want to look at the whole
21 sequence. I really want this part which I call
22 margins to have this margin."
23 MEMBER WALLIS: George, I don't see why
24 that you preserve this. And maybe you're arguing that
25 you shouldn't preserve this dichotomy where you have

1 this analysis which has criteria and all that, and
2 then you have the PRA. PRA is capable in principle of
3 absorbing the thermal hydraulic --
4 MEMBER APOSTOLAKIS: That's what I'm
5 arguing.
6 MEMBER WALLIS: That's what I argued, too.
7 MEMBER APOSTOLAKIS: Yes, it must be my
8 accent.
9 MEMBER WALLIS: So we agree. We agree.
10 MEMBER APOSTOLAKIS: I thought I was
11 arguing it very well.
12 MEMBER WALLIS: Thank you.
13 MEMBER APOSTOLAKIS: No?
14 MS. DROUIN: I don't agree quite with what
15 you said because your statement was that the thermal
16 hydraulics are done after the PRA.
17 MEMBER APOSTOLAKIS: Before. It's done
18 before.
19 MS. DROUIN: I was going to say, because--
20 MEMBER APOSTOLAKIS: And it sets the
21 acceptance criteria. And then the PRA tells you what
22 is the frequency of not meeting these criteria.
23 MS. DROUIN: Well, I mean you have to come
24 in first and, you know, and you define what your end
25 state is. Now if we're talking LWRs, you know, where

1 you do it in the piecemeal of a Level 1, Level 2,
2 Level 3 and, you know, you come in and what do you
3 mean by the onset of core damage and what does that
4 code calculate in trying to say this is what we mean
5 by it. And there is a lot of argument out there of
6 what is meant by that.
7 MEMBER APOSTOLAKIS: Exactly. And what
8 I'm proposing avoids that. Because it goes straight to
9 the regulatory limits that you impose. The figures of
10 merits, temperatures, pressures, whatever, flow rates,
11 and asks what is the frequency of exceeding that
12 figure of merit without caring whether that's core
13 melt or whatever. And this is very real for reactors.
14 These people are not thinking that way.
15 MS. DROUIN: You got to -- you have to
16 define your success criteria in the PRA or you don't
17 have a PRA.
18 MEMBER APOSTOLAKIS: Exactly. In the
19 current thinking you don't. And I'm saying that this
20 should be a new thinking.
21 MEMBER WALLIS: I don't know why you need
22 success criteria at all. You look at an accident, you
23 look at its consequence. And PRA predicts the
24 consequences.
25 MEMBER CORRADINI: Can I try it? I've

1 been listening. Can I try it.

2 MEMBER APOSTOLAKIS: Go ahead.

3 MEMBER CORRADINI: So what you're really

4 saying is, Tom was saying that the X axis should not

5 be dose, it should be curies. You're saying an

6 intermediate step is the frequency and the X axis

7 could be essentially temperature.

8 MEMBER APOSTOLAKIS: No, no, no.

9 MEMBER CORRADINI: I mean in some sense.

10 Because you're saying --

11 MEMBER APOSTOLAKIS: Then you have too

12 many curves.

13 MEMBER CORRADINI: No, I know.

14 MEMBER APOSTOLAKIS: Yes.

15 MEMBER CORRADINI: But I'm just trying to

16 connect what Graham is saying relative to what you're

17 saying. And in some sense there is a continual rain

18 of successfully getting to some point or temperature--

19 so it could be temperature. And then eventually it

20 rolls into -- it rolls up into curies released or dose

21 with the site. But eventually it's all the steps

22 along. That's what you guys are thinking --

23 MEMBER APOSTOLAKIS: No. I agree with

24 Graham. It's just that we're expressing it a

25 different way.

1 My point, my fundamental point is that
2 this curve as it's presented implies the frequency of
3 these rem is such-and-such, and I am saying it is not.
4 Because there is this intermediate step which is very
5 significant. This is the frequency of exceeding the
6 acceptance criteria. That's not --
7 MEMBER WALLIS: With the present method,
8 but if we do it right it can be the frequency.
9 MEMBER APOSTOLAKIS: Of course it can.
10 MEMBER WALLIS: Of course. Well, we're
11 going to design it to be right.
12 MEMBER APOSTOLAKIS: Right. And then we
13 go back, we look at the frequency of designing the
14 name of defense-in-depth how much -- we may very well
15 define new acceptance criteria. But that will be done
16 after you have a big picture.
17 MR. KING: It sounds to me, George, like
18 you're advocating the old way of doing business. The
19 designer decides do I need two pumps, three pumps, so
20 forth. And then he tests that design against this
21 curve.
22 MEMBER APOSTOLAKIS: No. I'm arguing the
23 other way.
24 MR. KING: Well, it didn't sound like it
25 to me.

1 MEMBER APOSTOLAKIS: No. I don't want
2 these acceptance criteria of two pumps. I want to go
3 all the way to temperature.
4 CHAIRMAN KRESS: Fission product release.
5 MEMBER WALLIS: But not temperature alone.
6 The consequences of the temperature in terms of fuel
7 damage and so on and so on and so on.
8 MEMBER APOSTOLAKIS: Right. We have to
9 agree on where to stop.
10 MEMBER WALLIS: Yes, right.
11 MEMBER APOSTOLAKIS: Because it's
12 inevitable to have some conservatives in somewhere.
13 And these, in my view, will have to be in the
14 regulatory limits. Because, you know, the onset of
15 damage is such a fuzzy thing. I mean so you say, like
16 the 2200 degree Fahrenheit. I mean, we all know that
17 if it's 2250, it's not the end of the world. Yet it's
18 a regulatory limit we all live with it, we're happy,
19 fine, instead of having a distribution. That's okay.
20 That's too much.
21 MR. KING: So why would you want to go to
22 temperature? Temperature doesn't have anything to do
23 with consequences?
24 MEMBER APOSTOLAKIS: It's an intermediate.
25 MR. KING: It could, but it does not --

1 MEMBER CORRADINI: It's an intermediate
2 measure.
3 MEMBER APOSTOLAKIS: Intermediate measure.
4 MEMBER CORRADINI: It's the same thing
5 that I think Tom was saying relative to curies for the
6 design versus dose at the site.
7 MEMBER APOSTOLAKIS: That's right.
8 MEMBER ABDEL-KHALIK: I mean wouldn't it
9 be ideal if we have a graph where the horizontal axis
10 is core failure probability?
11 MEMBER APOSTOLAKIS: Horizontal?
12 CHAIRMAN KRESS: I think you have to
13 define that. And I would just as soon put it in terms
14 of release of radioactive materials.
15 The one thing every reactor has in common
16 is if they go through an accident, they're likely to
17 release fission products. That ought to be the focus
18 of any of our criteria, is the release. And you ought
19 to be able to have a PRA that can tell you the
20 frequency of giving accident sequences that end up
21 with giving release quantities. If the PRA doesn't do
22 that, it doesn't do much.
23 MS. DROUIN: No, I mean the PRA does that.
24 I'm coming back to how -- you know, there's no problem
25 with doing your PRA where your end state is your

1 releases.

2 CHAIRMAN KRESS: Yes. And I think you get

3 away from core melt.

4 MS. DROUIN: You know, but whether or not

5 you do something that's core melt, but my point is

6 whatever you define as your end state, you know that

7 end state is based on what is the success criteria to

8 avoid that end state and then how do you define your

9 accident progressions, your sequences, without success

10 criteria.

11 CHAIRMAN KRESS: Well, I think the PRA

12 does that.

13 MS. DROUIN: Well, it does. But I'm

14 saying from the middle to that it's defining your

15 success criteria. I don't know how you go about --

16 you don't know what your success criteria is.

17 MEMBER APOSTOLAKIS: I think your argument

18 in the report is that if I take, for example, the

19 range of between 1 and 10 rem, okay. I have all the

20 frequencies, right, based on the criteria or the

21 guidelines you are giving how to screen out and select

22 and so on.

23 MR. KING: You have all the sequences that

24 fall --

25 MEMBER APOSTOLAKIS: Yes. And then you are

1 saying the LBE will be the sequence or maybe a bunch
2 of sequences whose consequences are the largest,
3 that's how I understand it, in that interval. Which
4 is fine.
5 Now the question is what is the frequency
6 of that largest consequence? If it is curies, then I
7 have to work backwards and I ask myself why do I have
8 this release? Oh, because this thing melted. Well,
9 what was the regulatory criteria, the limit for that?
10 It was 2000 degree Fahrenheit. There was something
11 else that failed because of high pressure. What was
12 the regulatory limit? And then I ask myself what is
13 the frequency of exceeding those limits?
14 MR. KING: Yes, but don't the PRA success
15 criteria depend on those limits? I mean that's where
16 those limits show up.
17 MEMBER APOSTOLAKIS: But the success
18 criteria have additional conservatisms They are a --
19 of those limits.
20 MR. KING: They might, but they don't have
21 to.
22 MEMBER APOSTOLAKIS: And we don't know
23 much probability. What kind of probability level
24 those success criteria represent. It's up to the
25 vendor now.

1 And for water reactors of existing, maybe
2 it's okay.
3 MR. KING: They look at each sequence and
4 see do you exceed those success criteria.
5 MEMBER APOSTOLAKIS: But it seems to me
6 that the staff should be interested in seeing this in
7 a new design. Because in new designs you have a new
8 ballgame. I mean you have to understand much more than
9 -- well how we understand about LWRs.
10 There was somebody?
11 Look, all I'm saying is this should be
12 explored. I'm not saying that what you're doing is
13 wrong, but this is trying to get away from the way
14 things are done now. Because you're entering a new era
15 of new designs.
16 CHAIRMAN KRESS: I'm at a loss to know
17 what your suggestion that they do, George, instead of
18 this.
19 MEMBER APOSTOLAKIS: The frequency should
20 include the margins, what they call margins. The
21 margins now in the document are separate. Completely
22 separately from the --
23 CHAIRMAN KRESS: How about if I just move
24 the curve down, does that take care of it?
25 MEMBER APOSTOLAKIS: It would. But then

1 you would have to --

2 CHAIRMAN KRESS: The curve is arbitrary.

3 MEMBER APOSTOLAKIS: But you would have to

4 do it in an intelligent way. You have to understand

5 what is the probability given this sequence of

6 exceeding the regulatory limit, which is the margin.

7 I mean, by saying I will remove it down by

8 a factor of two, well you can do. But that's --

9 MEMBER WALLIS: Well, it's not really the

10 regulatory limit. It's the probability of leading to

11 consequences. This is your --

12 MEMBER APOSTOLAKIS: Yes. But most

13 consequences are usually represented by a conservative

14 regulatory --

15 MEMBER WALLIS: Which, you know, you can

16 do that.

17 MEMBER APOSTOLAKIS: Otherwise you get

18 into the --

19 MEMBER WALLIS: But if you don't do it

20 conservatively, then you could propagate all the way

21 through to the end.

22 MS. DROUIN: I guess I don't agree. I

23 think if I understood what you were saying, George,

24 that yes, right now we do a PRA. Embedded in the

25 results of the PRA are margins. But to me that's a

1 good thing.

2 MEMBER APOSTOLAKIS: It's a conservative

3 thing, sure.

4 MS. DROUIN: You know, even when you do

5 your most realistic PRA you still have margin embedded

6 in there. I would not propose that you do a PRA with

7 the margins stripped away.

8 MEMBER APOSTOLAKIS: And I'm not saying

9 that.

10 MS. DROUIN: Well, see, that's what I

11 heard you were saying.

12 MEMBER APOSTOLAKIS: No. What I'm saying

13 is make the margins part of the frequency calculation

14 and then you decide how much margin you want to have.

15 MEMBER CORRADINI: Can I take an example

16 of what I think you're saying?

17 Take your curve and I'll give a simple

18 instance. The stair step, I still don't -- I

19 understand where you got it, but I don't particularly

20 -- so take ten to the minus 3 in dose and multiple it

21 by one. So that's a ten to the minus three. Then draw

22 a ten to the minus three line all the way down. Then

23 take it down an order of magnitude, take ten to the

24 minus one in frequency time ten to minus three and

25 make that another line. Now you've got two diagonal

1 lines.

2 What he's saying is in essence that if you

3 were to say I'm going to regulate off of that top

4 line, buried in there is margin. Once you evaluate --

5 or margin in all these various acceptance criteria.

6 Once you evaluate it you might find that the whole

7 thing has essentially lowered.

8 MEMBER APOSTOLAKIS: Yes.

9 MEMBER CORRADINI: And then you then argue

10 whether you want to be on the ten to the minus three

11 line or the ten to the minus four line because now you

12 evaluated all the behavior of the system. Is that

13 what you're saying, I think?

14 MEMBER APOSTOLAKIS: Close.

15 MEMBER CORRADINI: Okay. I'm sorry.

16 MEMBER APOSTOLAKIS: In the new reactor

17 designs it doesn't seem to me that the designers from

18 what I have seen are going to put too much redundancy.

19 They will have to rely a lot on the margin itself

20 arguing that there is very large heat capacity, you

21 know, the coolant will do its job and so on. In other

22 words, what we call now Level II PRA, which -- well

23 actually Level II is not even that. Level II is

24 accident.

25 The setting of the acceptance criteria

1 that now is done by the vendor using various codes,
2 that will play a much bigger role I think in these new
3 designs. Because of their novelty. I mean, having
4 three or four different loops to cool a reactor and
5 you have helium circulating and all that requires a
6 thermal hydraulic analysis. You can't just say I have
7 a two out of four systems.
8 MEMBER MAYNARD: I'd offer a little bit
9 differing opinion. I don't believe that we should be
10 trying to quantify all the margin in the PRA. I
11 believe it's important that we have margins segmented
12 in various areas. Because that's how we deal with
13 things that later we find such as that there was a
14 construction deficiency or if there was an aging issue
15 or something like that. You have operational margin
16 and you have design margin, you have regulatory
17 margin. And I think that it makes it much easier to
18 deal with issues that come up where we've got those
19 margins segregated out than trying to quantify all of
20 it into a PRA.
21 MEMBER APOSTOLAKIS: But the document does
22 require quantification. All I'm proposing is a
23 different use. The document is very clear in several
24 places that the margins should be quantified, right?
25 You make that very clear. So I'm not asking for a new

1 thing there.

2 MEMBER WALLIS: Then you have to say what

3 scale you're going to quantify them.

4 MEMBER APOSTOLAKIS: Oh, exactly. Yes.

5 Yes. So we're not disagreeing on that.

6 MEMBER WALLIS: I wondered, Mr. Chairman,

7 were we going to get through before lunch?

8 CHAIRMAN KRESS: No, by no means. We're

9 going to take a break for lunch, supposedly starting

10 now. We'll come back and continue this discussion

11 after lunch.

12 MS. DROUIN: I'd like to make a proposal.

13 You know, a lot of these issues that are being brought

14 up, you know, they're excellent. But they get into the

15 implementation and more of how we derive not just the

16 licensing base events, but the ultimate requirements.

17 And I think it might help if we spend a little bit of

18 time talking about how all this comes together.

19 Because ultimately, you know, we implement the full

20 framework and not just identifying the licensing base

21 events, but what this Part 53 would do. It's not just

22 from this frequency consequence curve. And I think

23 that's part of the problem here is that somehow

24 there's almost -- I get the sense that we're making

25 all these decisions based on this curve. And the

1 answer to that is no, we're not.

2 So I think it might help if we talked just

3 a little bit about where all these other things come

4 in to come up with the whole complete set of the

5 requirements so you understand --

6 CHAIRMAN KRESS: Okay. Let's plan on doing

7 that after lunch.

8 MS. DROUIN: Okay.

9 CHAIRMAN KRESS: And let's come back at

10 1:00. And I'm planning to recess until 1:00.

11 (Whereupon, at 12:03 p.m. the Committee

12 adjourned, to reconvene this same day at 1:00 p.m.)

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A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

1:00 p.m.

CHAIRMAN KRESS: Whenever you're ready, Mary, I think we can start again. And did you want to do some more talking before we continue with the --

MS. DROUIN: I wanted to jump and do a little bit on Chapter 8.

CHAIRMAN KRESS: I thought you might, yes.

MS. DROUIN: You know, because I think it may help.

DESIGNATED FEDERAL OFFICIAL FISCHER: You need to use that mike, Mary.

MS. DROUIN: Yes.

CHAIRMAN KRESS: I think we'll be off the record until they're ready to go.

(Whereupon, at 1:02 p.m. off the record until 1:04 p.m.

MS. DROUIN: For those who have a copy of the document in front of them, I'm on page 8-2.

And what this diagram here shows is how do we take all the different pieces that are in the framework document and when we turn the crank and generate all the technology-neutral or specific, the identification of this set of requirements that are already codified in Part 53 or some other way, how do

1 we get there. And the sense I was getting this
2 morning there was kind of an impression that it's just
3 halfway from the consequence curve. And that's not
4 true.
5 I mentioned in passing that we have the
6 protective strategies. And the protective strategies,
7 we have five of them starting with, you know -- maybe
8 I should pull those up.
9 MEMBER APOSTOLAKIS: Initiating event,
10 barriers --
11 MS. DROUIN: Correct.
12 MEMBER APOSTOLAKIS: Yes. We know.
13 MS. DROUIN: And the protective strategies
14 were meant to look at going from an event that could
15 challenge the plant to ultimately having a release.
16 And so if you had these protective strategies in
17 place, they were to hopefully, you know, prevent those
18 things from occurring so that you didn't have an event
19 given you had an event, you have those systems in
20 place to mitigate that event. Given those systems
21 failed, do you have some kind of barrier to contain
22 it. And given that you don't have -- you know, the
23 barrier fails, do you have some way to control the
24 consequences. So those were the protective
25 strategies.

1 Then we came in and said okay, we want to
2 write requirements for each of those.
3 MEMBER WALLIS: While you do that, this is
4 performance based. The strategies are a way of
5 meeting performance, right? The only thing that that
6 is is the measure of performance?
7 MS. DROUIN: The strategies -- no.
8 Strategies are identified where we want requirements.
9 MEMBER WALLIS: But that's saying how they
10 have to meet the performance, right?
11 MS. DROUIN: No.
12 MEMBER WALLIS: By having all these
13 strategies?
14 MS. DROUIN: Bear with me, that's not.
15 The strategies are just identifying what we want
16 requirements for.
17 MEMBER WALLIS: Yes. So you're going to
18 micromanage how they meet performance?
19 MS. DROUIN: No, we're not. Bear with me,
20 please.
21 MR. KING: Then it's high level defense-
22 in-depth, you know lines of defense. And from there
23 the requirements are derived. But they're just a high
24 level way to breakout the various defense-in-depth
25 type categories.

1 MS. DROUIN: It goes back that cartoon
2 viewgraph I had where you have this idea and you want
3 to start writing requirements. How do you know what
4 kind of requirements you need. And how do you know
5 you're complete. So all we're saying is that at a
6 high level we want requirements that would fulfill
7 these strategies. It's not how you're going to meet
8 them. We just want requirements there.
9 So let me not come to that figure. Let me
10 go to -- so then what we have said for each of those
11 strategies we're going to kind of do a logic diagram
12 that looks very similar to a fault tree. Because a
13 fault tree is a deductive analysis. So we want to
14 apply this deductive logic to break it down to
15 identify what are those things or topics, we call them
16 topics in the report, that could challenge that
17 protective strategy.
18 Again, we're not telling you how to meet
19 it. It's what are those things that could challenge it
20 or preclude that protective strategy from being
21 successful. So we're trying to identify the
22 challenges. And then based on those challenges, then
23 what requirements would you want in place?
24 MEMBER WALLIS: And all this has nothing
25 to do with the PRA?

1 MS. DROUIN: So far it has nothing to do
2 with the PRA.
3 MEMBER WALLIS: This is a whole lot of
4 extra stuff --
5 MS. DROUIN: This is the process of how we
6 would go about in identifying the requirements. And
7 so just not a bunch of people to be a little bit
8 sarcastic, sitting around a table and doing a lot of
9 good brainstorming. We're trying to put some
10 structure to it and some logic of what are those
11 requirements we need. Not exactly what that
12 requirement will be in terms of how you write it. But
13 just what we need requirements for.
14 So they're not falling out of this
15 consequence curve. They're falling out coming through
16 with each one of these protective strategies, you know
17 doing this logic, deductive reasoning --
18 MEMBER WALLIS: But doesn't all this go
19 into the PRA, this functional failure of protective
20 strategy leads to some consequence? Isn't that the
21 whole idea of the PRA?
22 MR. KING: The PRA is a way to implement
23 what comes out of here.
24 MEMBER WALLIS: But then why are you
25 micromanaging how they do it?

1 MS. DROUIN: This is not saying how
2 they're going to do it. This is an identification
3 process.
4 MEMBER APOSTOLAKIS: They are saying that
5 in addition to everything else, the staff would not
6 want to see too many initiators. The staff cares
7 about the integrity of the barriers even though these
8 are embedded are in a PRA, the barriers themselves are
9 of interest to us. You have to make sure that --
10 MEMBER WALLIS: So it's not performance
11 based anymore. It's virtual based?
12 MEMBER APOSTOLAKIS: No, this is defense-
13 in-depth. This is defense-in-depth.
14 MEMBER WALLIS: This is what you go
15 through to satisfy the staff rather than the
16 performance, right?
17 MEMBER APOSTOLAKIS: Performance comes
18 after you build that.
19 MR. KING: Some of the things that come
20 out of here are going to be performance related.
21 MEMBER BONACA: For example, the
22 requirements for stable operations seems to be a
23 reasonable expectation which you have.
24 MR. KING: Yes. Yes.
25 MEMBER BONACA: And then protective

1 systems you will expect that will have protective
2 systems?
3 MS. DROUIN: But this is a way of
4 identifying your requirements. Once you identify what
5 that requirement is -- and when I say "is," then you
6 would determine, okay, now how should I actually write
7 that requirement. And I would want to write it in a
8 performance manner.
9 Now just identify that I need a
10 requirement to -- there's no reason for me suggesting
11 this one, but I need a requirement to control gas. You
12 know, gas control. Now, what that requirement would
13 actually be, I would like to write that in a
14 performance-based manner. But how do I go about
15 identifying that I need a requirement for gas control?
16 You know, how do I need -- you know, when you look at
17 Part 50, how do I come up with what I write? You
18 know, identifying what I need? And so that's where we
19 put this structure was to say, okay, we go back to we
20 want to ensure the public health and safety. In
21 ensuring the public health and safety, we want to make
22 sure that we're controlling events, we're putting
23 protective systems in place. You know, we want
24 barriers. And what are those things then that could
25 challenge those? And then so we want requirements

1 there to impose on the design so that the design to
2 the optimum possible that these things don't occur.
3 Let me open up the Appendix. Is it
4 Appendix G or H?
5 MEMBER APOSTOLAKIS: So you are
6 essentially anticipating the oversight process later?
7 MS. DROUIN: And in some, you know --
8 MEMBER APOSTOLAKIS: Yes, in a sense
9 that's what you're doing.
10 MS. DROUIN: -- you're making a nice one-
11 to-one mapping. I was going to try and show you an
12 example of one of the fault trees. These are the
13 outputs from the tree. Okay, here's one.
14 Functional failure barrier integrity.
15 That's the fourth protective strategy. So it just
16 walks down through and looks at how can this not -- I
17 mean, what could challenge this to happen -- to not
18 happen. Sorry.
19 MEMBER WALLIS: Well, aren't these all
20 just things you'd put into your PRA and you got to
21 evaluate all these things.
22 MS. DROUIN: Okay. This is nothing to do
23 with the PRA right now. This is independent of the
24 PRA. This is saying, okay, I want a protective
25 strategy that, you know, barrier of integrity on these

1 barriers and would could challenge the function of
2 barrier integrity. And so it just starts walking down
3 through it and identifying.
4 And then all of these things coming out
5 are possible challenges that could preclude -- could
6 challenge your barriers.
7 MEMBER APOSTOLAKIS: Mary, would you say
8 that this a form of Appendix B requirements, quality
9 assurance?
10 MS. DROUIN: No. This is simply
11 identifying--
12 MEMBER APOSTOLAKIS: Well, that's what
13 this is. It says, you know, make sure that you use
14 good quality materials, make sure this and this and
15 this.
16 MS. DROUIN: No, no. That's a requirement.
17 That would fall out from this.
18 MEMBER APOSTOLAKIS: Yes.
19 MS. DROUIN: So this is coming in. And
20 like right here on this one it says BI-1. So this is
21 the barrier integrity topic one. And you see here it
22 says "How should adequate barrier design" -- I need
23 glasses -- "design integrity and reliability be
24 assured."
25 MEMBER APOSTOLAKIS: Yes.

1 MS. DROUIN: Okay. Now --

2 MEMBER WALLIS: You are telling them how

3 to do it. You're not saying we have a criterion for

4 adequate design. You're --

5 MEMBER APOSTOLAKIS: I guess Graham is

6 saying that you all you need is the first column.

7 Express your concern and let them figure out how to do

8 it.

9 MEMBER WALLIS: Let them figure out how to

10 do it.

11 MEMBER APOSTOLAKIS: That's what you're

12 saying.

13 MEMBER WALLIS: Right.

14 MEMBER APOSTOLAKIS: Instead of having the

15 second column that says design barriers must be

16 consistent with such and such and such. How should

17 I--

18 MS. DROUIN: Well, how should adequate

19 barrier design and reliability be ensured, we're just

20 taking it a step further.

21 MEMBER APOSTOLAKIS: I understand. But

22 he's objecting to it.

23 MEMBER WALLIS: If you define the

24 reliability that you want, we'll design it to meet

25 your specifications. You don't need to be told how to

1 design it.

2 MEMBER APOSTOLAKIS: Could be.

3 MS. DROUIN: We're not telling them how to

4 design it when you read what's here. This would be

5 translated into a requirement that would be, to the

6 extent that it's appropriate and an ability to do it,

7 would be performance-based. So you go to Appendix --

8 I don't remember what appendix it is that gives the

9 guidelines for how you would take -- we've said, okay,

10 we want a requirement that deals with this. So this is

11 not the requirement here. This is still an

12 identification as we want a requirement in design that

13 deals with how should adequate barrier design,

14 integrity and reliability be assured.

15 MEMBER WALLIS: What's your criterion for

16 knowing it's good enough?

17 MS. DROUIN: That's a different question.

18 All I'm trying to do here --

19 MEMBER WALLIS: Well, I can wrap it in a

20 tin foil or something and say that's good enough, I've

21 put a barrier there. Unless you've got some kind of an

22 evaluation on it.

23 MR. KING: You're going to just go back to

24 that frequency consequence curve --

25 MEMBER WALLIS: Yes, okay. So that's --

1 MR. KING: And where those advance up
2 through ten to the minus fifth --
3 MEMBER WALLIS: Right. Let's derive it
4 from that, not try to make --
5 MR. KING: However, it has to be maintain
6 its integrity such that you don't exceed the FC curve.
7 MEMBER WALLIS: Yes. Yes.
8 MS. DROUIN: The frequency consequence
9 curve is helping you how to write the requirement.
10 The frequency consequence did not identify the need
11 for this requirement. That's what I'm trying to say
12 differently here. And it seemed to me that people
13 were thinking that you use the frequency consequence
14 curve to identify what requirements you need. It's
15 not. That's helping me how to write it.
16 MEMBER APOSTOLAKIS: But I think the real
17 disagreement is that we don't need the second column
18 to tell people what to do. Once you say that you want
19 to have adequate barrier designs so their liability is
20 assured, the framework should leave it at that. And
21 then maybe regulatory guides or something else will
22 come in and say --
23 MEMBER WALLIS: These are acceptable ways
24 to do it.
25 MEMBER APOSTOLAKIS: Yes.

1 MEMBER WALLIS: That's right.

2 MEMBER APOSTOLAKIS: It's not a big deal,

3 but you know it's a good point.

4 MR. LEHNER: Yes. Actually we've gone a

5 little bit beyond that in that we have put some

6 deterministic requirements on the barriers, for

7 instance, in certain frequency ranges. If you could

8 look at our chapter 6, it said that in the frequent

9 range, which is ten to the minus two or greater, you

10 should have no barrier failure. In the infrequent

11 range you should have at least one barrier remaining.

12 So these are things beyond the PRA that are in there

13 for defense-in-depth purposes.

14 MEMBER APOSTOLAKIS: But if you have a

15 frequency ten to the minus two of what? Of a certain

16 dose, right?

17 MR. LEHNER: Yes.

18 MEMBER APOSTOLAKIS: What does it mean to

19 require a barrier? And the dose, presumably, is very,

20 very low at such a high frequency. So to say that one

21 barrier remains intact, can that barrier deal with

22 what? With the release of radioactivity.

23 MR. KING: Because we're trying to meet

24 the frequency consequence curve. This is --

25 MEMBER APOSTOLAKIS: We already met it.

1 But now you are saying no, in addition to that I want
2 a --
3 MR. KING: And that's a defense-in-depth
4 provision.
5 MR. LEHNER: Yes, you could meet the
6 frequency consequence curve by having, you know, very
7 -- in theory you could meet it by showing that your
8 initiators are so low that you could grab your -- use
9 two fold for your system and still meet the frequency
10 consequence curve because I'm never going to get to
11 a--
12 MEMBER APOSTOLAKIS: But the ten to the
13 minus two is the frequency of that dose. It's not the
14 initiating event frequency.
15 MR. KING: Well, it's initiating event
16 frequency on the FC curve the way we present it. And
17 then for all events that are in that frequency range,
18 they have to meet that dose requirement.
19 MEMBER WALLIS: They must have
20 consequences.
21 MEMBER APOSTOLAKIS: The FC curve, the
22 frequency is the frequency of the initiator? Not the
23 sequence.
24 MR. KING: No. The sequence. The
25 sequence.

1 MEMBER APOSTOLAKIS: The sequence?

2 MR. KING: Yes, it's the sequence.

3 MEMBER APOSTOLAKIS: So that's what I'm

4 saying. That you have the dose and there is a ten to

5 the minus two. Okay. That ten to the minus two is

6 the frequency of leading to that dose.

7 MR. KING: All the sequences that are ten

8 to the minus two or greater have to meet that dose.

9 MEMBER APOSTOLAKIS: Right. Right. So

10 what's the point of saying I want an additional

11 barrier?

12 MR. KING: Defense-in-depth. There are

13 some defense-in-depth in here.

14 MS. DROUIN: And that was the part, if I

15 go back over here --

16 MEMBER APOSTOLAKIS: I mean how does that

17 work? I mean this is the frequency of something

18 failing and leading to that doors.

19 MR. KING: Defense-in-depth is --

20 MEMBER APOSTOLAKIS: Now if you put an

21 extra barrier, you're changing the frequency.

22 MEMBER WALLIS: Right. Yes. So no one can

23 have a failure denying that there's any frequency of

24 anything.

25 MEMBER APOSTOLAKIS: Then you are pushing

1 the frequency down.

2 MEMBER WALLIS: To zero.

3 MR. KING: But we are not saying it can

4 never fail. We're saying, like the things Dana

5 mentioned aging and so forth that are accounted for in

6 the PRA, defense-in-depth measures are put in there to

7 try and take care of those things.

8 MEMBER APOSTOLAKIS: No. But I'm trying to

9 understand the curve again. Between one and 10 rem

10 the frequency limit is ten to the minus three. Now you

11 say no, but I also want an extra barrier. The

12 existence of that barrier is already folded into the

13 ten to the minus three. If you put another barrier,

14 then it's not ten to the minus three anymore. It's

15 something else.

16 MEMBER ABDEL-KHALIK: That's a different

17 sequence.

18 MEMBER APOSTOLAKIS: Yes. You are changing

19 the sequence.

20 MEMBER ABDEL-KHALIK: Right. Different

21 event.

22 MR. LEHNER: It's not already folded in,

23 because like I said in theory you could meet it with

24 just having very -- you know, no initiating frequency.

25 MEMBER APOSTOLAKIS: You know,

1 conceptually I'm trying to understand. I'm not saying
2 you're wrong. I'm just trying to understand what that
3 means.
4 You have a ten to the minus two, but then
5 you want an extra barrier. And my point is that the
6 ten to the minus two includes the existence of these
7 barrier.
8 MEMBER CORRADINI: But it doesn't include
9 the performance of the barrier, and you're giving an
10 internal performance --
11 MEMBER APOSTOLAKIS: Well, no. It should.
12 MEMBER CORRADINI: I guess what's
13 bothering me is, I mean what you're saying I think is
14 correct.
15 MEMBER APOSTOLAKIS: Yes.
16 MEMBER CORRADINI: But I -- but if you do
17 it this way, I could generate a design that would not
18 need containment. Would we be comfortable with that?
19 I mean --
20 MEMBER WALLIS: No. You have a separate
21 difference in depth requirement. I mean it says you
22 must have --
23 MEMBER CORRADINI: But that's what they're
24 essentially doing here. That's essentially what
25 they're doing.

1 MR. LEHNER: Yes. We are saying you want
2 a minimum of two barriers when you go in --
3 MR. KING: We're not saying you need an
4 extra barrier. We're saying if you -- yes. If you met
5 the ten to the minus two because of a barrier, that's
6 fine. We're not saying you need one in addition to
7 that.
8 MEMBER APOSTOLAKIS: Okay. So what you're
9 saying is that the frequency -- the sequence that
10 leads to this rem should not consistent of one event.
11 The ten to the minus two should not be the failure or
12 occurrence of a single thing. It should be the
13 combination of something.
14 MR. MRORCA: This is Bruce Mrorca.
15 An example would be if you had a ten to
16 the minus two sequence and the requirement for
17 defense-in-depth is zero barrier failures, so you have
18 all barriers intact. So if you have a steam generator
19 2 rupture sequence that's greater than ten to the
20 minus two, and let's say that sequence met the
21 frequency consequence curve, however it essentially
22 has barrier failures, it would not meet the defense-
23 in-depth criteria. So that sequence would not meet
24 the acceptance criteria and would have to be modified
25 such that it would have zero barrier failures or it

1 would have to be reduced in frequency where it's
2 allowed to have a barrier failure.
3 So embedded in the sequence is both the
4 frequency to sequence includes whatever equipment is
5 required for that sequence to mitigate that sequence.
6 But in this case we put additional defense-in-depth
7 criteria, deterministic criteria in addition to the
8 frequency calculation.
9 MR. KING: Look at it this way, George.
10 We're saying up front for defense-in-depth purposes a
11 minimum of two barriers. Now when you start looking
12 at the accident sequences that occur for the ones that
13 are more likely, we want small consequences. That's
14 what the frequency consequence curve says.
15 We also deterministically say for those
16 things that are likely to happen, we don't want either
17 of those barriers to fail.
18 MEMBER APOSTOLAKIS: Well, that's what
19 bothers me. Because there's always a probability of
20 a failure of a barrier. You can't say you don't want
21 them to fail. They're in the PRA, as George points
22 out. You've got to say it's a sequence, must have at
23 least two barriers for which the frequency of failure
24 of evaluated.
25 MEMBER WALLIS: That's different, and I

1 think that's what you mean.

2 MR. KING: That's what we mean.

3 MEMBER APOSTOLAKIS: That's you mean.

4 MR. KING: The frequency would be lower

5 than ten to the minus two or whatever.

6 MEMBER WALLIS: When you say a barrier

7 will not fail, that's an allusion.

8 MEMBER APOSTOLAKIS: Yes, the frequency --

9 MR. KING: You're more precise in saying

10 it.

11 MEMBER APOSTOLAKIS: The frequency you're

12 calculating, I think the requirement should be in

13 certain -- you don't impose that on all of them,

14 right? It's only for the high frequencies.

15 MR. KING: Right.

16 MEMBER APOSTOLAKIS: That should be the

17 result of two or more failures. In other words, you

18 shouldn't rely only on the fact that you may not have

19 a small LOCA, because you could design your pipes to

20 be very reliable.

21 MR. KING: The reliability has to be --

22 MEMBER APOSTOLAKIS: Right. It has to be

23 plus something else.

24 MR. KING: Yes.

25 MEMBER APOSTOLAKIS: So you're sort of

1 sneaking into it a single failure criteria?

2 MR. KING: Yes. Exactly.

3 MEMBER WALLIS: Now wait a minute. You're

4 requiring more defense-in-depth for the events with

5 small consequences.

6 MEMBER APOSTOLAKIS: Right. Yes.

7 MEMBER WALLIS: It doesn't make any sense.

8 It's got to be the other way around. It doesn't make

9 any sense at all.

10 MR. KING: You don't want likely events to

11 lead to very large consequences.

12 MEMBER APOSTOLAKIS: No. You want defense-

13 in-depth against the big events which are harder to

14 predict. You don't need a lot of defense-in-depth

15 against things which happen every day and which you

16 can mitigate. You need defense-in-depth for the big

17 events which you can't predict very well. All the ones

18 which you think you've forgotten or something. That's

19 where you need defense-in-depth.

20 MR. KING: Well, this includes defense-in-

21 depth for those, too. But we're saying we start out

22 with the LOCA events --

23 MEMBER APOSTOLAKIS: Because the other

24 ones, the ones that happen everyday, you've got to get

25 a lot of experience with you've got to learn how to

1 handle them.

2 MR. KING: Yes, but look at this way,

3 those things you know are going to happen, you want to

4 be sure with high reliability that the off site dose

5 is really small.

6 MEMBER APOSTOLAKIS: But it is already

7 small.

8 MR. KING: Not necessarily.

9 MEMBER APOSTOLAKIS: Well, then you

10 shouldn't have a higher likely one that has a big

11 dose.

12 MR. KING: Well, as you go on down in

13 frequency, lower frequency the doses go up. But you

14 recognize that those are more severe events and the

15 requirements then instead of saying two barriers

16 should remain intact, it's down to one barrier.

17 MEMBER APOSTOLAKIS: You don't need a

18 containment for the small events, the small dose

19 that's site bounded, which might everyday. You need

20 the containment for the big thing that's hard to

21 predict that you're not quite sure about. That's why

22 you need the containment.

23 MS. DROUIN: But we have defense-in-depth

24 because of our uncertainties, short and simple.

25 MR. KING: But the big thing is going to

1 likely damage the other barriers --

2 MEMBER APOSTOLAKIS: That's why you need

3 the containment.

4 MR. KING: Yes, exactly. And this gets to

5 that.

6 MEMBER APOSTOLAKIS: No. Because if the

7 additional barrier fails, you're in a different

8 sequence and different consequences.

9 MR. KING: Exactly. The consequence goes

10 up.

11 CHAIRMAN KRESS: Right.

12 MEMBER APOSTOLAKIS: Protection not

13 against the range we're talking about. It's protection

14 from the thing evolving to something worse.

15 MR. KING: Yes. And you don't want the

16 little things to damage the barriers that you kind of

17 have there for the big events.

18 MEMBER BONACA: I mean most of the act of

19 protection system functions are really keyed on making

20 certain events, very frequent, okay, have no

21 consequences.

22 MEMBER APOSTOLAKIS: Right. The way I

23 understand it is that this unnecessary because it's

24 already covered by the other requirements you have for

25 higher consequences. Because you are reducing the

1 frequency, necessarily then for the sequence of ten to
2 the minus two that leads to this dose to become
3 something that leads to a higher dose requires
4 additional failures. So already some barrier is
5 intact. Otherwise it would be in a different event.
6 MR. LEHNER: I think in practice that's
7 true. I mean all we're saying is that, as I said
8 before, theoretically you could say, you know, I don't
9 need any barriers because my initiating events are so
10 low that I can meet this curve with no barriers.
11 That's what this is trying to prevent. That kind of
12 a--
13 MEMBER ABDEL-KHALIK: I look at this as
14 just another constraint where you're plotting the
15 minimum number of intact barriers against frequency.
16 So you have an FC curve which allows you to identify
17 various sequences of high probability in the various
18 consequence range, but you also have another
19 constraint. The minimum number of intact barriers
20 that you need to have in each frequency range.
21 MR. KING: That's the defense-in-depth.
22 MEMBER WALLIS: That's not defense-in-
23 depth. As George points out, in order to get the
24 consequences very low you need lots of barriers.
25 Okay. That's in the PRA.

1 MEMBER APOSTOLAKIS: It's already dealt
2 with.
3 MEMBER WALLIS: You need defense-in-depth
4 for the other end, the unlikely event. And he just
5 said that. I think you just said you need it for the
6 unlikely event.
7 CHAIRMAN KRESS: It's not necessarily true
8 that you need all those barriers to get frequency of
9 those back consequences now. You could very well show
10 for a PBMR -- gas cooled reactor.
11 MEMBER APOSTOLAKIS: You show what?
12 CHAIRMAN KRESS: But you may want to get
13 a barrier there anyway.
14 MEMBER WALLIS: Because of uncertainty
15 about a possible --
16 CHAIRMAN KRESS: Uncertainty.
17 MS. DROUIN: You have a defense-in-depth
18 for those things that are not in the PRA and they
19 aren't in the PRA because either you don't know about
20 them, which is the biggest one --
21 MEMBER APOSTOLAKIS: No.
22 MS. DROUIN: You don't know. These are
23 the unknown unknowns. I get those words confused. But
24 anyway, it's the things that we don't know are the
25 things we think we know about and are completely --

1 MEMBER APOSTOLAKIS: We only have a
2 containment for things which are not in the PRA?
3 MR. KING: It's to take care of
4 uncertainties.
5 MEMBER APOSTOLAKIS: Are you serious?
6 MS. DROUIN: I'm sorry?
7 MEMBER APOSTOLAKIS: You only have a
8 containment for a light water reactor because of the
9 things that aren't in the PRA?
10 MS. DROUIN: No. I said we have defense-
11 in-depth because of uncertainties.
12 MEMBER APOSTOLAKIS: Well, containment is
13 the ultimate defense-in-depth.
14 Why do you have a containment? I mean if
15 you look at the AP-1000 you could conclude it doesn't
16 need a containment because the core damage frequency
17 is so low that the value of the containment is a few
18 hundred bucks a year.
19 MS. DROUIN: That's right.
20 MEMBER APOSTOLAKIS: But you put it on
21 anyway.
22 MS. DROUIN: You put it on anyway
23 because--
24 MEMBER APOSTOLAKIS: Why? Because of the
25 possible large events which you haven't foreseen and

1 which might be the containment --

2 MS. DROUIN: That's what I just said.

3 MR. KING: And this doesn't rule --

4 MEMBER APOSTOLAKIS: You said you put it

5 on for the minuscule ones that happen everyday.

6 MS. DROUIN: No, no. I just said -- I

7 don't know. What I just said was we have it there

8 because of uncertainties. The things that we don't

9 know about.

10 MEMBER APOSTOLAKIS: And not about the

11 minuscule events that aren't the big ones.

12 MS. DROUIN: We have not been able to

13 model them.

14 MR. KING: Yes, the big events. But it's

15 also there to help you on the minuscule ones. I mean,

16 it's there.

17 MEMBER APOSTOLAKIS: But not to have to

18 prevent the things which you think are going to happen

19 very often. It's there to prevent the things which

20 might happen but you haven't thought of, but you don't

21 think they're going to happen very frequently.

22 MR. KING: Yes.

23 MEMBER APOSTOLAKIS: But it's there for

24 the low --

25 MEMBER BONACA: Did someone claim that

1 these extra barriers of containment, it's always
2 there?
3 MS. DROUIN: I mean we can quibble -- let
4 me finish answering --
5 MR. KING: I have a requirement for what
6 we call a containment functional performance.
7 Depending on the technology, you know it's not always
8 going to be a large dry containment. But there is a
9 containment functional performance requirement.
10 MS. DROUIN: I want to get back to Graham.
11 I mean, because we are in agreement.
12 MEMBER WALLIS: Good.
13 MS. DROUIN: Some of it may not being
14 expressed well here, but we have defense-in-depth
15 because of uncertainties, because of the things we
16 don't know about. And how do we handle, you know we
17 may think that the risk is so very low on some of
18 these reactors, but that's based on our knowledge;
19 what we think we know. And there might be some things
20 out there we don't know that could drastically change
21 that risk. And so that's why we have defense-in-
22 depth.
23 If we were absolutely positive of our
24 knowledge and we were able to quantify and model
25 everything, then you wouldn't need defense-in-depth.

1 But we don't know everything and some of the things we
2 do know, we don't them accurately. So we want defense-
3 in-depth in there for that.
4 MEMBER APOSTOLAKIS: Absolutely correct.
5 So this is the general statement of why we want
6 defense-in-depth. I think the question here was very
7 specific.
8 MS. DROUIN: Well, I understand that. But
9 I disagree that you think that you think it's a
10 general statement. I can't tell you how many arguments
11 we've had with people for just that fundamental why
12 you have defense-in-depth there.
13 MEMBER APOSTOLAKIS: But this Committee is
14 with you on that. We are all structuralists.
15 MS. DROUIN: Now once you get past that,
16 then how do you implement it and how do you define it?
17 DESIGNATED FEDERAL OFFICIAL FISCHER:
18 Mary, I think Graham's concern is when you look at the
19 framework in section 6 where they talk about
20 additional deterministic criteria, it applies
21 additional deterministic criteria a lot to events with
22 high frequency, you know more frequent than ten to the
23 minus two -- between ten to the minus two and ten to
24 the minus five there's a little less additional
25 deterministic criteria. And when you get below ten to

1 the minus fifth there's no additional deterministic.

2 MEMBER APOSTOLAKIS: That's one point.

3 DESIGNATED FEDERAL OFFICIAL FISCHER:

4 Okay. And I think he's making that point. It's

5 counter-intuitive to him the way you went somewhat

6 backwards in applying less and less.

7 MS. DROUIN: I need to go back and look

8 and see how that was written. Because I can tell you

9 the way we developed the defense-in-depth, the way we

10 defined it, the way we have defined the principles and

11 the way we have implemented it has not been based on

12 that.

13 MEMBER BONACA: I mean it seems to me

14 these barriers or conditions are put there so that

15 events do not propagate to a less frequent but more

16 severe event. So you're putting a lot of provisions.

17 And I would suspect the same sequence will appear in

18 different frequency categories depending on the many

19 factors you're assuming.

20 MEMBER APOSTOLAKIS: But the point, Mario,

21 is that the reason why it's ten to the minus two and

22 not ten to the minus three is because some barrier is

23 intact; that's the point.

24 MEMBER BONACA: That is true.

25 MEMBER APOSTOLAKIS: You don't have to say

1 that again. However, you can say -- invoke defense-in-
2 depth and say for example that the ten to the minus
3 two should not come primarily from administrative
4 measures. Because remember the six items of defense-
5 in-depth in the regulatory guide. Over reliance on --
6 what is it -- administrative -- dramatic things should
7 be avoided. That I understand. Because that addresses
8 the issue of ten to the minus two, where did it come
9 from. But to say that one extra barrier has to be --
10 yes, there will be. Because if it fails, then you're
11 in a different sequence, different consequences. So
12 that specific guide talks about a barrier is
13 unnecessary. But the other stuff about defense-in-
14 depth is very valuable.
15 MR. KING: And Mario expressed it very
16 well. You don't want likely events to propagate into
17 severe events. That's why you have more things that
18 you require for the likely events. Eventually you're
19 going to get to a point where low probability events
20 are going to wipe everything out.
21 MEMBER APOSTOLAKIS: Sure. Yes.
22 MEMBER WALLIS: So you have a containment
23 on existing reactors in order to protect yourself
24 against the high probabilities of AOO type things?
25 MR. KING: No. You have requirements on

1 maintaining fuel integrity, you have requirements on
2 maintaining coolant boundary integrity. And then you
3 have containment.
4 MEMBER BONACA: By the way, the figure you
5 have, figure 65 -- well illustrates this point.
6 MEMBER APOSTOLAKIS: Can we see that?
7 Page what?
8 MEMBER BONACA: It's six dash four.
9 MS. DROUIN: But before we go there,
10 somehow there's an impression that it's just not
11 accurate. And if you go here to table 8-2 this how the
12 defense-in-depth is implemented in terms of what
13 requirements are needed for defense-in-depth. And for
14 each of the principles, which are coming down here and
15 we identified six defense-in-depth principles. And
16 across the top here you have the protective
17 strategies.
18 What kind of defense-in-depth we needed
19 was independent of that curve. Here's what we're
20 saying is that when you go in and we're identifying
21 what we need for physical protection or stable
22 operation for this principle this is what, you know,
23 you need to be doing to meet defense-in-depth. And--
24 MEMBER WALLIS: What does integral design
25 process mean? That's what I think I'm saying, is that

1 the designer takes account of all of this stuff.
2 Isn't that what that means at the top there?
3 MR. KING: Not necessarily. That means in
4 the past the design has been done and then security
5 has been sort of an overlay on it. This is suggesting
6 that to be done hand-in-hand.
7 MEMBER WALLIS: Well, it should.
8 MR. KING: Which is something additional
9 than what's required today.
10 MEMBER WALLIS: Yes, we agree with that.
11 MR. KING: We're saying that we're
12 requiring that because of defense-in-depth, so that
13 you better integrate the things is defense-in-depth is
14 what we're saying here. You may not agree with that,
15 but that's what we're saying.
16 MEMBER WALLIS: What's this provide
17 containment functional capability? That only appears
18 in that box. Why is it over there?
19 MEMBER APOSTOLAKIS: Where is that?
20 MR. KING: It's under barrier integrity.
21 Protective strategy for barrier integrity. And that's
22 where we get to containment.
23 MS. DROUIN: Right. So I mean the
24 principle is right here. Account for uncertainties in
25 performance and provide safety margins.

1 MEMBER APOSTOLAKIS: This is fine under
2 barrier.
3 MS. DROUIN: And then when you look at --
4 when you come back up here to --
5 MEMBER WALLIS: Well, how do you decide
6 when a containment is necessary?
7 MEMBER APOSTOLAKIS: We're always saying
8 we want containment functional capability. Exactly
9 what that has to be will be different depending on the
10 technology you're looking at. But there are some
11 words in the framework that tells you what the
12 performance of that has to be.
13 MEMBER WALLIS: You're going to get in
14 real trouble with me when you start talking about
15 safety margin. Because I don't know what it is. It's
16 talked about everybody. I don't know what it is
17 because it's never been defined.
18 MS. DROUIN: Well, we did take a cut at
19 defining it in the framework.
20 MEMBER APOSTOLAKIS: Conceptually you take
21 a cut at it. But there is a limit, a limit, a limit.
22 You don't go the extra step and say there will be some
23 uncertainty on the assessment and then the probability
24 of exceeding --
25 MEMBER WALLIS: You list all the sequences

1 and stuff and you put in all the uncertainties and you
2 show there's a certain probability of exceeding
3 something. Then I think I begin to understand what
4 you mean by safety margin.
5 MR. KING: That's the idea. It talks
6 about safety margin and regulatory limits. Take the
7 2200 degrees --
8 MEMBER WALLIS: But I don't understand how
9 -- yes, but --
10 MR. KING: There's some distribution as to
11 at what temperature --
12 MEMBER WALLIS: Presumably the 2200
13 degrees is there because it's the 95th percentile of
14 something or other --
15 MR. KING: Yes, exactly.
16 MEMBER WALLIS: -- and the mean is under
17 2500 and so on.
18 MR. KING: Exactly. That's this concept.
19 MEMBER WALLIS: If you quantify the
20 probabilities, then you're telling me something about
21 what you mean by safety margin.
22 MEMBER APOSTOLAKIS: And they ask for
23 that. They do ask for the quantification.
24 MR. KING: Slide 27.
25 MEMBER WALLIS: But I don't know what a

1 containment does for safety margin. I think it's
2 something laid on by decree.
3 MR. KING: Those are two different things
4 and we didn't --
5 MS. DROUIN: And we don't require, as you
6 can see for defense-in-depth, an actual containment.
7 We ask for a functional capability.
8 MR. KING: We don't ask for a traditional
9 containment.
10 MS. DROUIN: That's right.
11 MR. KING: IT could be different. But it
12 has to perform the same function. It has to retain
13 fission products for these very unlikely events.
14 MEMBER WALLIS: Very unlikely events, huh?
15 Good. Thank you. We're getting there.
16 MEMBER APOSTOLAKIS: Move up a little bit.
17 MS. DROUIN: Go up?
18 MEMBER APOSTOLAKIS: Just a little.
19 MEMBER APOSTOLAKIS: Okay. So not depend
20 number 3. That is that? What's the heading of that
21 column?
22 MS. DROUIN: That's the defense-in-depth
23 principle.
24 MEMBER APOSTOLAKIS: Could you go up so we
25 could see it?

1 MS. DROUIN: Here, this is the defense-in-
2 depth principle.
3 MEMBER APOSTOLAKIS: And this is now for
4 frequency. Let's look at the top case, stable
5 operation.
6 MR. LEHNER: Those are the protective
7 strategies.
8 MS. DROUIN: These are the protective
9 strategies.
10 MEMBER APOSTOLAKIS: So provide at least
11 two barriers. For what?
12 MEMBER WALLIS: Fission product release,
13 presumably.
14 MR. KING: Yes. For defense-in-depth
15 purposes. This table is defense-in-depth measures
16 that have been put in.
17 MEMBER APOSTOLAKIS: And this is
18 considering the dose?
19 MR. KING: Yes. Well, the idea is that it
20 reduces the dose.
21 MEMBER APOSTOLAKIS: Yes. But I mean when
22 you say two barriers, I have to demonstrate I have two
23 barriers between an initiator and the ultimate dose.
24 MR. KING: Right.
25 MEMBER WALLIS: So having the cladding and

1 the reactor vessel is two barriers, or the reactor
2 coolant system?
3 MR. KING: Yes.
4 MEMBER WALLIS: You don't need a
5 containment, right? You got a cladding --
6 MR. KING: And you get to that next one
7 down on number 5 it says --
8 MEMBER WALLIS: But suppose your accident
9 is the loss of one of the barriers? Then you've only
10 got one left?
11 MR. KING: Still have containment. We've
12 separated out the --
13 MEMBER WALLIS: Well you've got two
14 barriers. Then you got another barrier. But --
15 MR. KING: Put containment aside, we want
16 two barriers. Containment is brought in as a separate
17 item.
18 MEMBER WALLIS: Okay. Well, there's two
19 barriers besides the containment?
20 MR. KING: Right.
21 MEMBER APOSTOLAKIS: But these
22 requirements are not frequency independent. Because
23 for some of the rare events you don't have two
24 barriers. You have failed just about every thing.
25 MR. KING: That's what Mary was reading

1 from that table that said, hey, for the frequent
2 events you want both of those barriers to remain
3 intact--
4 MEMBER APOSTOLAKIS: And frequent is
5 defined?
6 MR. KING: For the infrequent you can lose
7 one and for the really rare ones you can lose them
8 both, but you still have the containment to back that
9 up.
10 MEMBER APOSTOLAKIS: Okay. Okay. And my
11 point --
12 MEMBER CORRADINI: That's what's worrying
13 me now.
14 MEMBER APOSTOLAKIS: And my point is that
15 the fact that they're already frequent means that you
16 have at least barriers.
17 MR. MUBAYI: That is correct.
18 MEMBER APOSTOLAKIS: Kind of superfluous.
19 MR. MUBAYI: I think that is the right
20 thing, too. And that is the interpretation meant in
21 the framework that you have those barriers intact and
22 they keep you within that frequency range.
23 MEMBER APOSTOLAKIS: You don't have to say
24 it here.
25 MS. DROUIN: But you're not doing this

1 because of the frequency.

2 MEMBER APOSTOLAKIS: Right.

3 MS. DROUIN: This is independent of the

4 frequency. You have to have it. You have to have two

5 independent, redundant diverse means for reactor

6 shutdown and decay heat removal.

7 MR. KING: The frequency comes in, Mary,

8 where they can start to fail. And they can only start

9 to fail when you get into the less frequent events.

10 MS. DROUIN: Well, I understand that.

11 MR. KING: So it does bring it in and it

12 matters.

13 MEMBER APOSTOLAKIS: It is there?

14 MS. DROUIN: Yes, but you're not imposing

15 this because of something that came out of that.

16 You're imposing this because of the defense-in-depth

17 principle

18 MEMBER APOSTOLAKIS: But if I take this

19 literally and I go to the ten to the minus five

20 sequences, I -- I have to impose two additional

21 barriers?

22 CHAIRMAN KRESS: You start out with two.

23 MS. DROUIN: You start out with two as a

24 minimum.

25 CHAIRMAN KRESS: These are the --

1 MEMBER APOSTOLAKIS: In general, two
2 barriers?
3 CHAIRMAN KRESS: -- design criteria.
4 MEMBER APOSTOLAKIS: Oh.
5 MS. DROUIN: Yes. Thank you, Tom.
6 CHAIRMAN KRESS: The design will come in
7 with these in it or else.
8 MEMBER ABDEL-KHALIK: Right. But is this
9 table all inclusive, though, or can somebody who is
10 really bright come up with other strategies to address
11 the basic problem?
12 MR. KING: Well, you can come in and
13 propose whatever they want.
14 MEMBER ABDEL-KHALIK: Right. I mean these
15 are just guides for the designer
16 MR. KING: These are requirements. If
17 these were turned into a rule, they can still come in
18 and propose what they want.
19 MEMBER WALLIS: Right. These should be in
20 a reg. guide then. These should be in a reg. guide.
21 MR. KING: They just have to request an
22 extension for that rule.
23 Or, I mean it sounded like somebody
24 suggesting you be more general in the regulation and
25 put these details in a reg. guide. That's a

1 possibility.

2 MEMBER APOSTOLAKIS: But don't you think,

3 though, that you should be specific as to what the

4 barriers -- no, the point is this: If your ultimate,

5 if you want to argue that there will be two barriers

6 between an initiator and release of radioactivity,

7 that's very different from saying two barriers between

8 initiator and damage to the fuel. So here it's kind

9 of general. So --

10 MS. DROUIN: I don't want you all walking

11 away with the idea that we're using the PRA to

12 determine--

13 MEMBER APOSTOLAKIS: No, it's not PRA.

14 It's not PRA. It has nothing to do. It has nothing

15 to do with PRA.

16 MS. DROUIN: -- with to what extent these

17 things are implemented.

18 MEMBER APOSTOLAKIS: The word "barrier,"

19 means I separate something from something, right?

20 That's a barrier. And I'm asking what are these two

21 somethings?

22 MR. KING: The two somethings are the

23 frequency consequence curve. For a given frequency of

24 a sequence you got to meet a certain dose. And

25 overlaid on that is defense-in-depth requirement that

1 says even though I meet that dose, if it's a very
2 frequent accident sequence, I want to make sure I
3 still have those two barriers intact.
4 CHAIRMAN KRESS: These would apply to the
5 licensing basis events.
6 MEMBER WALLIS: Can I answer George's
7 question? I think the barriers are between the
8 radioactivity that's in the fission products and the
9 fuel and the public. Separating one from the other;
10 that's why the barriers are there.
11 Did I answer your question, George?
12 MEMBER APOSTOLAKIS: But the question is
13 whether that's what they meant. It could be.
14 MEMBER WALLIS: But that's you're trying
15 to do or state.
16 MEMBER ABDEL-KHALIK: To me this is sort
17 of meddling in design specs in a sense that your --
18 MS. DROUIN: Yes, it is.
19 MR. KING: Right, but we want a couple of
20 other features on there for defense-in-depth.
21 MEMBER WALLIS: Like we're managing the
22 design.
23 MS. DROUIN: No. You're not micromanaging
24 the design. What we're trying to do is not make this
25 a risk-based set of regulations. We are trying to make

1 all the decisions that are coming out of your PRA.
2 Because the PRA has a lot of uncertainties associated
3 with it. And the insights that can come out of the
4 PRA are very good, but you know they could be wrong in
5 places. So in terms of trying to identify the
6 requirements that would go in this Part 53, we don't
7 want them based just coming out of insights from the
8 PRA.
9 MEMBER WALLIS: Well, I think you've got
10 to be careful. Because if you have two barriers which
11 are rather weak, and each has a probability of failure
12 at point one, you may be better off with one barrier
13 which is very strong and has a much smaller
14 probability of failure.
15 MS. DROUIN: Well, now we can discuss
16 whether these are the right defense-in-depth
17 principles, whether -- or say we like the defense-in-
18 depth principles, we could come in and debate is this
19 the right way to implement each defense-in-depth
20 principle.
21 MEMBER APOSTOLAKIS: That's what we're
22 doing. We are not questioning --
23 MS. DROUIN: Right. But I mean it seems
24 like you're coming back to well we don't need this.
25 And I said no, this is an inherent part of not having

1 this thing risk-based.

2 MR. KING: And what you suggested can't

3 happen there --

4 MEMBER APOSTOLAKIS: No. I think you

5 misunderstand the questions. Nobody's questioning

6 that statement there. No key safety function dependent

7 on a single human action.

8 MR. KING: Right.

9 MEMBER APOSTOLAKIS: This is an extra

10 defense-in-depth, yes. Human actions are in the PRA,

11 they have probabilities. But this is fine.

12 The question is whether the provision of

13 at least two barriers is meaningful. It's the

14 implementation of the concept. That's what we're

15 questioning.

16 MR. LEHNER: And actually, in chapter 6

17 we've stated it a little bit differently, which may be

18 more to what you're talking about. We're saying that

19 for the frequent events there's no barrier failure.

20 For the infrequent events at least one barrier

21 remains.

22 MEMBER APOSTOLAKIS: What are these ranges

23 now? Infrequent is what?

24 MR. LEHNER: Frequent is greater then ten

25 to the minus two. Infrequent is from ten to the minus

1 two to ten to the minus five.

2 MEMBER APOSTOLAKIS: And I think -- I'll

3 getting there. I repeat. The fact that the frequency

4 is there, you've shown systematically there is a

5 barrier that is fine. That's all I'm saying. I'm not

6 saying that the concept is wrong. It's just that this

7 is not needed as opposed to what's next to it, which

8 is needed. I like that. But you shouldn't rely on a

9 single human action.

10 MEMBER WALLIS: You're mixing up defense-

11 in-depth with what George is saying. I mean having a

12 lot of barriers for the small things reduces the

13 frequency. And it's already there.

14 MEMBER APOSTOLAKIS: Yes. That's how the

15 frequency goes down.

16 MEMBER WALLIS: And I think defense-in-

17 depth is something else other than that. It's putting

18 in a barrier when you wouldn't think you needed it at

19 all in order to be sure.

20 MR. LEHNER: We're not adding barriers --

21 MR. KING: That is wrong. I think what

22 we're saying is each barrier when you're talking about

23 the frequent events, and we don't want the barriers to

24 fail, each barrier has to be more reliable than the

25 ten to the minus two. It's not the combination of the

1 two. Each one. And then when you get down to one
2 barrier, it's one barrier.
3 MEMBER APOSTOLAKIS: We exhausted this?
4 MR. KING: Huh?
5 MEMBER APOSTOLAKIS: I think we exhausted
6 this. Let's move on.
7 Mr. Chairman, I have a question. Are we
8 going to address differences between what you propose
9 and what EPRI proposed, the PPMR?
10 MS. DROUIN: No.
11 MEMBER APOSTOLAKIS: And why not?
12 MS. DROUIN: Because we aren't prepared to
13 do that.
14 MEMBER APOSTOLAKIS: But we will do it at
15 some point? Because it's important to know how other
16 people view the --
17 MS. DROUIN: I mean, if you all wanted to
18 come back and do that comparison, we can. But weren't
19 prepared to do that today.
20 CHAIRMAN KRESS: Or if you want to ask a
21 question about --
22 MR. KING: There is an Appendix that
23 compare the NEI proposal to what we're proposing.
24 MEMBER APOSTOLAKIS: Is NEI the same as
25 EPRI?

1 MR. KING: No. They're two different
2 organizations, but I --
3 MEMBER APOSTOLAKIS: No, but there is a
4 report that says EPRI.
5 MR. KING: There is.
6 MEMBER APOSTOLAKIS: And they comment on
7 your --
8 MEMBER BONACA: If I remember in the EPRI
9 report --
10 MEMBER APOSTOLAKIS: Biff isn't there a
11 report from EPRI?
12 MR. BRADLEY: There's an EPRI report that
13 didn't come in through ENI. I don't know how that
14 was--
15 MEMBER WALLIS: It come from SRI's.
16 MEMBER APOSTOLAKIS: But there is an EPRI
17 report which was given to us. And there is a statement
18 there that there are some significant differences. And
19 for the life of me, I couldn't see them. And so I was
20 wondering whether you guys knew what --
21 MEMBER BONACA: I agree a 100 percent. I
22 have the same -- I can't --
23 MEMBER APOSTOLAKIS: I couldn't figure out
24 what the one with the CCDF curve.
25 MEMBER BONACA: That's not the one that

1 has the CCDF curve. Yes.

2 MEMBER APOSTOLAKIS: You can go from one

3 to the other. And they objected to using the

4 existing--

5 MEMBER SHACK: That's one question. You

6 know, why don't you put in a CCDF curve?

7 MR. KING: Yes, let's start that way.

8 MEMBER SHACK: You know, we keep coming

9 back to that. Now, you know, it's not as though you

10 guys are unaware of CCDF curves. You made a conscious

11 decision not to go that way. I have my own guesses as

12 to why you did that, but you can explain to us why you

13 choose that.

14 MS. DROUIN: We had this discussion

15 yesterday. And for the life of me, you know to be

16 honest, I'm not sure anymore why we don't have it in

17 here.

18 MR. KING: Well, the original reason was

19 we calculate the QHOs, and that takes care of the

20 cumulative effect.

21 MEMBER SHACK: I mean my argument is that

22 the reason -- that what you've done here is to built

23 into criteria that have already been accepted in

24 regulatory space. You know, your frequency consequence

25 curve is built on criteria that are already built into

1 your regulatory space. Your QHO is already built into
2 your regulatory space.
3 If you were going to introduce a CCDF
4 concept, then we'd have to decide what that curve
5 would be. And I just assumed you want to deduct the
6 discussion.
7 MEMBER APOSTOLAKIS: And I'm curious if
8 you convert what they have to an approximate straight
9 line, okay, the CCDF in low block space, whether that
10 line would have a strong risk aversion if I --
11 MR. KING: No, it's--
12 MEMBER APOSTOLAKIS: Huh? It depends on
13 the slope.
14 MS. DROUIN: Why the --
15 MEMBER APOSTOLAKIS: What do you mean the
16 slope is one?
17 MR. MUBAYI: I'm sorry. It does have a
18 risk aversion.
19 CHAIRMAN KRESS: Right near the end --
20 MR. MUBAYI: It's actually built into it.
21 It would not be a straight line. It would come it in
22 with a different slope on a log-log basis near the
23 higher doses.
24 CHAIRMAN KRESS: Yes, but not much.
25 MR. MUBAYI: Pardon?

1 CHAIRMAN KRESS: You could put a straight
2 line on there real easy.
3 MEMBER WALLIS: But the way that you
4 interrupt -- the product of consequence and frequency
5 is constant in this diagram.
6 MR. MUBAYI: It's not constant.
7 MEMBER WALLIS: It is. It's very constant.
8 It's a slope of minus one.
9 MR. MUBAYI: If you --
10 MEMBER APOSTOLAKIS: But is it constant
11 here?
12 CHAIRMAN KRESS: Almost, except right near
13 the end there.
14 MR. MUBAYI: Yes, near the end. But
15 that's you really -- where the risk aversion comes in.
16 CHAIRMAN KRESS: Where?
17 MR. MUBAYI: Up to 25 rem it's basically,
18 you know --
19 MR. KING: A straight line.
20 MR. MUBAYI: Yes.
21 MEMBER WALLIS: Why is it not straight at
22 10,000 rem?
23 MR. MUBAYI: No, you don't go to 10,000.
24 MEMBER WALLIS: And then you turn around.
25 Why is there nothing at 10,000, though? Why didn't

1 you--

2 MR. MUBAYI: They're all dead by then.

3 MR. KING: At that high we figure you

4 probably won't meet the QHOs. It's a cut off.

5 MEMBER WALLIS: That can happen.

6 MEMBER APOSTOLAKIS: Well, what's the

7 answer, Mary, that you don't remember why you did it

8 this way.

9 MS. DROUIN: I'll tell you, it's for some

10 reason I know we had convinced ourselves that it

11 wasn't going to add to much value beyond what we had.

12 I'm trying to find it in the document because --

13 MEMBER APOSTOLAKIS: Maybe for

14 presentation purposes you should show first the line

15 and then the discreditization.

16 MEMBER WALLIS: Well, I disagree entirely.

17 You should start off with some principle of what's the

18 effect on the public. And that's where you cc,

19 whatever you call, the real FC curve is. Start with

20 that. Now this is what we're trying to achieve. And

21 then you can explain why this meets that goal.

22 MR. KING: Well, we did. We started with

23 the QHOs and said this is what we're trying to

24 achieve--

25 MEMBER WALLIS: You didn't start a

1 cumulative frequency curve.

2 CHAIRMAN KRESS: The problem I have with
3 that is I can design a plant based on deriving
4 requirements that it meet the QHO. And then somebody
5 is going to say I want to put ten of those plants on
6 a site or I want to put them in downtown New York or
7 something. And all at once I no longer QHOs because
8 I got ten of these plants or I got a site that wasn't
9 suitable for it.

10 I don't like starting from the QHOs
11 because that's a site related characteristic.

12 Now if you use an FC curve, cumulative --
13 complimentary cumulative distribution function that is
14 equivalent of a CDF and a LERF except not saying the
15 CDF and LERF comes from the QHOs, they're just design
16 requirements. You make them such that your new plant
17 if they meet this, then it's very likely that they'll
18 met the QHOs on most sites. That's to be determined
19 on a site basis and where they put them, and how many
20 they're going to put there. But that's to be
21 determined later. That's not a design function.

22 And that's where you need this FC curve.
23 And it's not a public health representation as the
24 QHOs. It's a design curve for fission product
25 release.

1 MR. KING: But that doesn't solve your ten
2 plants on a site issue?
3 CHAIRMAN KRESS: It does if you make that
4 design curve such that about-- if they meet that,
5 they're automatically meet about ten plants on most
6 sites.
7 MR. KING: It lowers the --
8 CHAIRMAN KRESS: And that's where I say
9 your FC curve ought to be the equivalent, functional
10 equivalent of a CDF of ten to the minus five and a
11 LERF of ten to the minus fix. Because then you can put
12 ten of those on most sites and you'll meet the QHOs.
13
14 MEMBER APOSTOLAKIS: But I don't --
15 CHAIRMAN KRESS: You'll have to determine
16 that later.
17 MEMBER APOSTOLAKIS: I really wouldn't
18 want the design curve to be so low that if you put
19 ten, you meet the site requirements. You should have
20 separate site requirements
21 CHAIRMAN KRESS: Sure.
22 MEMBER APOSTOLAKIS: And then, you know,
23 you design.
24 CHAIRMAN KRESS: Sure. But what happens--
25 MEMBER APOSTOLAKIS: And then you're

1 saying, you know, for this site I meet it with --
2 because what if they buy, you know, very small
3 reactors.
4 CHAIRMAN KRESS: But if you have a FC
5 curve for design, you have to put it at some level.
6 That if you put so that likely you'll only meet one
7 plant on a site to meet the QHOs --
8 MEMBER APOSTOLAKIS: Sure. Yes.
9 CHAIRMAN KRESS: Or there's two of them or
10 three of them. I said use ten. That's probably your
11 base.
12 MEMBER APOSTOLAKIS: But there will be an
13 extra site requirement.
14 CHAIRMAN KRESS: If you had to do that,
15 there's --
16 MEMBER APOSTOLAKIS: First of all, the
17 QHO--
18 CHAIRMAN KRESS: The site requirements,
19 though, should be the QHOs because --
20 MEMBER APOSTOLAKIS: Expanded, though?
21 CHAIRMAN KRESS: Expanded, yes.
22 MEMBER APOSTOLAKIS: To include societal
23 things.
24 CHAIRMAN KRESS: Yes. Right. But that's
25 separate. You don't want to include those in your

1 design except implicitly.

2 The FC curve you come up for design

3 acceptance ought to have in mind that if I stick two

4 of these plants on any site, I'm likely to meet the

5 QHOs. But you don't want that to be a --

6 MEMBER APOSTOLAKIS: On what site, though?

7 You see, that's my point. You may design the thing

8 and depending on the site you may be able to put three

9 such reactors or Xs.

10 CHAIRMAN KRESS: You'll have to decide

11 that when you select the site.

12 MEMBER APOSTOLAKIS: That's right.

13 CHAIRMAN KRESS: You go to the site and

14 say can I put five of these or one of these or ten.

15 And if there's already two reactors there, maybe you

16 don't use that site.

17 MEMBER WALLIS: But, Tom, the QHOs say

18 nothing about siting. I thought the QHOs referred to

19 some lunatic who stood at the site boundary and waited

20 to be ready.

21 MEMBER APOSTOLAKIS: He's a regular type

22 person --

23 CHAIRMAN KRESS: I thought George -- and

24 I'll say you need another augmentation. Those are good

25 rules, those QHOs.

1 MEMBER WALLIS: But it doesn't say you
2 can't put it in New York City.
3 CHAIRMAN KRESS: No, but --
4 MEMBER WALLIS: QHOs don't say that.
5 CHAIRMAN KRESS: But well there's other
6 population requirements.
7 MEMBER APOSTOLAKIS: But let me come back
8 to my earlier question. Is it correct to assume that
9 there is an NEI proposal? Biff, listen. Is there an
10 NEI proposal on the framework?
11 MR. BRADLEY: We commented on --
12 MEMBER APOSTOLAKIS: You commented on the
13 proposal by the staff, but you're not proposing
14 anything yourselves?
15 MR. BRADLEY: We have no independently
16 developed a framework.
17 MEMBER APOSTOLAKIS: Okay.
18 MR. BRADLEY: We had some comments on the
19 staff framework.
20 MEMBER APOSTOLAKIS: Okay. So we have the
21 comment --
22 MR. KING: And in the NEI 020-02, that was
23 the thing that kicked this whole project off.
24 MR. BRADLEY: Yes. That was -- but I
25 think we've all pretty much moved beyond that point.

1 I'm not assuming that 02, whatever that is, is still
2 currently in play at this point.
3 MEMBER APOSTOLAKIS: But in seems to me in
4 order --
5 MS. DROUIN: And I would go even further
6 that NEI has moved away from what you all in 02-02?
7 MR. BRADLEY: Yes, we have. Yes.
8 MEMBER APOSTOLAKIS: I would say that for
9 this Committee to make an informed decision at the
10 end, whatever the end is, we would really need to know
11 in detail what other organizations have proposed and
12 how they differ from yours. And if we don't do this
13 today, when are we going to do it?
14 And there is the EPRI report and the IAEA
15 report with which I think you were involved.
16 So, Mary, when are we going to do this?
17 Are we going to write a letter after this meeting?
18 CHAIRMAN KRESS: Yes. But our letter after
19 this meeting could -- number one, it has to respond to
20 a staff requirement that's -- they're asking about
21 separate items. We don't need to respond to those.
22 But I thought in addition this meeting would be a
23 meeting where we could say do we have a problems with
24 this whole concept and discuss that.
25 MEMBER APOSTOLAKIS: So there will be

1 other occasions for us to write a different letters?
2 CHAIRMAN KRESS: I don't know.
3 MEMBER SHACK: Staff is planning to stop
4 work.
5 CHAIRMAN KRESS: I think this is -- if we
6 go write a letter, this probably ought to be the time
7 to d it.
8 MS. DROUIN: Let me talk about just real
9 quick trying to get to your question on comments that
10 we have received. I mean, you know here's all the
11 comments that came in from the last -- let me back up.
12 You know we had a major workshop in March
13 of '05. And we had an equivalent, you know, bound
14 comments that we got. And we took those into
15 consideration when we went into this latest revision.
16 We have gone through all these comments.
17 Generally if I had to summarize the
18 comments in a couple of sentences, generally at a
19 conceptual level everybody was very favorable. Liked
20 the concept, et cetera.
21 Where the difference is, if you want to
22 call them differences, or that the comments really
23 kind of got into the details of it and it was more
24 they weren't really yes or no on some of this stuff,
25 it was I'd like to see this implemented and tested.

1 And then you can come back and really then get into
2 the details of what is the right way on some of this
3 stuff. But it wasn't -- I mean, there were some places
4 I don't want to say where they weren't in agreement.
5 But for the most part it was I want to see how this is
6 implemented, let's test it.
7 MEMBER APOSTOLAKIS: Which seems to me is
8 your position, too, isn't it?
9 MS. DROUIN: We don't disagree. Because
10 a lot of this stuff, you know we're going into new
11 area. It sounds good. We did a very limited test on
12 just trying to see if you use the selection of the
13 licensing base events. You know, we went to a current
14 plant where we had a PRA and tried to gain insights of
15 how it would work there. It seemed to work. But that
16 was a very narrow thing that we did, so I don't want
17 to misrepresent it. Because it is very, very narrow
18 and limited.
19 But overall how would some of this stuff
20 work and how would that translate into requirements?
21 We have come up with a draft. It wasn't in this July
22 version. It would be in the version that we would
23 publish this summer is here's using this approach.
24 And once you turn that crank what does that really
25 mean in terms of specific requirements. We've taken

a shot at that. But it would be nice to test this.

MEMBER APOSTOLAKIS: So what is Bill said true, you're going to stop working on this now and that's it? We forget about it or what?

MS. DROUIN: If we go back -- let me get back to our presentation. I'll just skip to the very end.

CHAIRMAN KRESS: Slide 10.

MEMBER WALLIS: Before you go there, George --

MS. DROUIN: Oh, no it's --

MEMBER SHACK: Slide 10.

MS. DROUIN: Yes. Sorry.

MEMBER APOSTOLAKIS: So what is it?

MS. DROUIN: You know right now what the plan is on the framework is that we would publish it the way it is now. It would be published as a NUREG. We add an appendix to this NUREG that would go through and summarize all the stakeholder comments. And the way right now we're looking to summarize them is that we've grouped the comments into five categories.

Comments that what we call are observations and don't really require for you to make a change to the framework.

Comments that deal more with

1 implementation of it and they would be dealt with if
2 you ever implemented it.
3 Comments where they really caught
4 something that we need to change right now.
5 The next set is comments where we just
6 disagree. And we would have an explanation of why we
7 disagree.
8 Which category did I forget? There were
9 five groups.
10 And this would all be in the appendix.
11 MEMBER APOSTOLAKIS: Okay. But let's say
12 that a miracle happens and DOE decides to in fact
13 built the NGNP. Then in my view if you stop working
14 on this, the most likely way that they will choose to
15 proceed will be with the existing regulatory system
16 amended or with exemptions here and there, just as the
17 PBMR people three years ago told us they would like to
18 go.
19 MS. DROUIN: Yes.
20 MEMBER APOSTOLAKIS: So in real life are
21 we going to have an opportunity to actually test this?
22 Because the guys, the NGNP people don't care about
23 frameworks. They will say they want to build this.
24 We're not going to try and test your ideas.
25 MS. DROUIN: I'm going to say something

1 that I'd for Stu to get up and correct me if I say it
2 incorrectly.
3 MEMBER APOSTOLAKIS: Well, let him say it
4 first.
5 MS. DROUIN: But in the advanced reactor
6 research plan, you know we did put in there that in
7 terms of when we look at the NGNP in particular and
8 develop the licensing strategy and develop some of
9 this, that you know we were going to rely on heavily
10 on what's int he framework.
11 MEMBER APOSTOLAKIS: Oh, you would.
12 MS. DROUIN: But I don't know if you want
13 to --
14 MEMBER APOSTOLAKIS: Stu?
15 MR. RUBEN: Okay. Stu Ruben, Office of
16 Research.
17 One of the projects that I've been
18 involved with in addition to supporting Mary is be
19 part of the team, interoffice team looking at the
20 licensing strategy for the NGNP.
21 The first piece of that strategy is what
22 we've come to call a licensing approach. And the big
23 part of that is to what extent should probabilistic
24 information be used in the development of the
25 requirements for licensing the plant. And the spectrum

1 of options that we're looking at right now includes
2 going all the way back to basically a very
3 deterministic approach that we used very early on, 30
4 years ago, at Fort St. Vrain. Looking at a prism-type
5 approach, which was basically deterministic and using
6 probabilistic insights to supplement that.
7 The next option is to use what we'll call
8 a risk-derived approach, one that we've never seen to
9 completeness. And we're now seeing what the
10 challenges would be to actually go down that path.
11 Many policy decisions would have to be made to
12 implement that. So we need to keep our eyes wide
13 open.
14 The final option would be to actually base
15 it on new regulations that would be derived from the
16 framework technology. And we're looking at --
17 MEMBER APOSTOLAKIS: How is the third
18 option different from the fourth?
19 MR. RUBEN: Well, the third option
20 basically we would be using the current body of
21 regulations that were derived for light water
22 reactors. And we would adapt those requirements,
23 wouldn't write any new requirements. We would simply
24 adapt those requirements for the NGNP design, being a
25 very high temperature gas reactor with PRA insights.

1 MEMBER APOSTOLAKIS: But I thought that
2 was the second one you had.
3 MR. RUBEN: No. No, the second one is you
4 start out with a very deterministic approach to
5 selecting events, to selecting safety systems, to
6 establishing margins, the way you do your safety
7 analysis. But you would still have the PRA to see,
8 hey, did I forget anything in selection of events,
9 let's say.
10 MEMBER APOSTOLAKIS: What's the first one
11 then?
12 MEMBER POWERS: Oh, Jesus. I don't care
13 anymore.
14 MS. DROUIN: Stu -- Stu --
15 MR. RUBEN: All I'm saying is there is a
16 spectrum. We're looking at what we'll call the risk-
17 derived, use of a PRA as an underlying basis for event
18 selection and applying engineering judgment to augment
19 that, et cetera. Okay. We're looking at that. And
20 we're working with DOE. And presumably the industry
21 will weigh in on what their preferences are.
22 MS. DROUIN: And in your licensing your
23 plant, you got to license it against something. And
24 what exists right now is Part 50 and Part 52. That's
25 what exists.

1 MR. RUBEN: That's what exists.

2 MS. DROUIN: That's what's on the table.

3 So if something came in today, right now, they would

4 have to be licensed under Part 50/52. So then the

5 question is can the framework document in terms of the

6 technical issues that are in there, and there's policy

7 issues associated with, can you use some of that work

8 in helping to identify what in Part 50 is applicable

9 to this new design and what you can give an exemption

10 to. To help you make those decisions.

11 So right now that's the only way the

12 framework could be used.

13 Now if you're looking down the future, you

14 know, do we create a new set of regulations so that

15 when the applicant comes in it's not just Part 50 or

16 53. I mean it could be a new Part 50 that has a new

17 appendix that has all this stuff in it. Or it could

18 be anew Part 53, that's just packaging. But it's a new

19 whole set of regulations against which you're going to

20 license that plant. But I mean as of today, you know

21 to say I want to license against the framework, that

22 is a meaningless statement. The framework is not a

23 set of regulations. It's Part 50 and 52 and do you use

24 the thinking, the technical thinking in that document

25 to help you make decisions under the current 50/52.

1 MEMBER ABDEL-KHALIK: So why don't you
2 publish this framework as an SRP?
3 MS. DROUIN: Because it's not an SRP.
4 MR. KING: Because it's not an SRP.
5 MS. DROUIN: It's not an SRP. It's
6 technically document.
7 MEMBER SHACK: But functionally it would
8 provide the same guidance.
9 MS. DROUIN: You could develop an SRP.
10 MEMBER SHACK: Correct.
11 MS. DROUIN: Based on -- and those are
12 kinds of, you know, decisions you know. You could
13 develop some regulatory guidance for the licensee.
14 You could develop an SRP to help the staff in making
15 these decisions under the current Part 50/52.
16 MEMBER APOSTOLAKIS: When Commission
17 McGaffigan said let's stop the development and try to
18 test it, you know, for a particular technology, which
19 technology do you think he had in mind? I mean, would
20 that be the test would not be a real application for
21 a license, right? Because you can't really do that.
22 You can't use some applicant's application testing
23 your framework. The guy wants decisions. So I don't
24 understand this.
25 MS. DROUIN: Well, it depends on what

1 you're trying to test. I mean, you know, if you're
2 trying to -- you could come in and develop a
3 regulatory guide to support the license of an advanced
4 reactor Part 50 and you're testing that regulatory
5 guide as part of that application; yes, you could do
6 that. Would you want to do it that way is another
7 question. But you certainly could do it that way.
8 MEMBER APOSTOLAKIS: Well, I don't know if
9 anybody thinks that way, but it seems to me this is
10 the end of this. Judging from what Stu is saying, the
11 most likely option is the second. They will go using
12 existing criteria, supplement it by risk insights,
13 which makes perfect sense. In fact if you want to have
14 some decisions in a reasonable amount of time.
15 MR. RUBEN: Well, I would say from a
16 decision point of view that might be the safest,
17 surest way to go. But whether or not industry would
18 be enthusiastic about that, at least for HGGRs, it
19 would be unlikely.
20 The prism reactor submittal was based on
21 a deterministic approach fundamentally and using PRA
22 to supplement it, or risk-informed.
23 The HGGRs, the VHTR, the NGNP I suspect
24 would like to see a more risk-derived approach.
25 MEMBER APOSTOLAKIS: They understand that

1 PBMR guys are submitting white papers those guys are
2 reviewing?
3 MR. RUBEN: Yes.
4 MEMBER APOSTOLAKIS: What kind of
5 regulatory process do they --
6 MR. RUBEN: Okay. They are -- it's kind
7 of hybrid, let me say that. They are basing their
8 application on Part 52 and Part 50. As Mary said,
9 those are the only regulations that exist right now.
10 It's the only basis that they could apply for a
11 license or a license or a design certification.
12 However, in terms of applying those regulations it
13 wants to use heavily the PRA and probabilistic
14 insights to select events, select design basis events,
15 select safety related system, establish vessel
16 treatment requirements, establish defense-in-depth
17 requirements, much like the framework is trying to do
18 from a blank piece of paper. But if you look at those
19 front end pieces, the framework and the PBMR approach
20 have very much a lot in common. And I think your
21 question to see those two front end pieces would be
22 very helpful and informative at some point when we're
23 ready to talk about that.
24 MS. DROUIN: I think in terms of testing
25 it, my personal view is that you should go the next

1 step, and that next step is trying to develop the
2 regulatory guidance of how this would get this
3 implemented and help you in your decision making. And
4 in developing that, you're testing it in essence.
5 MEMBER APOSTOLAKIS: But shouldn't you
6 have a design in mind?
7 MS. DROUIN: Yes, you should.
8 MEMBER APOSTOLAKIS: Which one?
9 MS. DROUIN: Oh, I'm using a gas filled
10 reactor. Absolutely.
11 CHAIRMAN KRESS: I'd use the PBMR because
12 it's already got all the --
13 MEMBER APOSTOLAKIS: But there are no
14 plants to do this.
15 CHAIRMAN KRESS: -- necessary inputs you
16 need.
17 MEMBER APOSTOLAKIS: Yes, but there are no
18 plants to do it.
19 CHAIRMAN KRESS: Huh?
20 MEMBER APOSTOLAKIS: There are no plants
21 to do anything like that. Right now there are no
22 plants to test this.
23 CHAIRMAN KRESS: No.
24 MR. RUBEN: Not the framework's scheme of
25 event selection, et cetera. But the front end piece of

1 frequency consequence curve that there has been
2 discussion about, they start out with that as a
3 starting point as well, for example.
4 MS. DROUIN: Right. But you know, and
5 therein lies the problem. You look at the high level.
6 You know, everybody conceptually we're all in
7 agreement. The disagreement comes in the next level,
8 and that's where you need to write, you know or
9 developing that implementing guidance to see what
10 works and what doesn't work.
11 MEMBER WALLIS: When you wrote the
12 framework did you start off with a problem definition
13 phase where you said this is why we can't use the
14 present regulations, this is what the new regulation
15 based on that framework have to achieve?
16 MS. DROUIN: Yes.
17 MEMBER WALLIS: You wrote all that stuff
18 down?
19 MS. DROUIN: Yes.
20 MEMBER WALLIS: And you wrote down all the
21 variety of reactors it has to be able to handle and
22 all that stuff. And then when you got to the end did
23 you check that you met the specs that you laid out at
24 the beginning?
25 MS. DROUIN: I think we have. Whether

1 we've been successful or not --

2 MEMBER WALLIS: Okay. I wasn't sure that

3 happened.

4 MS. DROUIN: But that's where -- you know,

5 why this document is as thick as it is. And a lot of

6 that information that you're looking for, Graham, is

7 in these detailed appendixes.

8 MEMBER WALLIS: What's in the appendixes.

9 Yes, okay. I didn't get to those appendixes. Okay.

10 What's a barrier? What's a barrier? I

11 think the fuel has various barriers in it itself,

12 doesn't it?

13 CHAIRMAN KRESS: Yes.

14 MEMBER WALLIS: So how many barriers are

15 there in the PMMR fuel itself?

16 MEMBER POWERS: Essentially none.

17 MEMBER WALLIS: Well, he says there are

18 none, but they claim --

19 MEMBER POWERS: That's what I was waiting

20 for.

21 MEMBER WALLIS: But don't they claim there

22 are several barriers in the fuel itself.

23 MR. KING: There is only one they rely on

24 for fission product retention.

25 MEMBER POWERS: Right.

1 MEMBER WALLIS: Because there isn't a
2 problem with how many barriers are in the fuel?
3 MEMBER POWERS: Which is essentially
4 useless.
5 MEMBER CORRADINI: Don't hold back.
6 MEMBER POWERS: Let's see, a couple of
7 things. At some time I've got to understand why we
8 have to design this CDF or frequency consequence curve
9 for ten plants on a site. And I'm not going to bother
10 you about that since that's not your proposal.
11 CHAIRMAN KRESS: You have to come up with
12 a number.
13 MEMBER POWERS: What I see, Mary, when you
14 talk about defense-in-depth, you say two words, two
15 phrases one of which is welcome and one of which
16 grates like a fingernail on a blackboard to me. Okay.
17 MS. DROUIN: Wait a minute. One of them
18 is welcome and one is the blackboard scraping? Well,
19 those are kind of extreme.
20 MEMBER POWERS: Yes. You say we use
21 defense-in-depth to cover uncertainties and then you
22 also as you talk a little bit say okay, we also do it
23 because we may be wrong. And in can you elaborate a
24 little bit for me here on this at all? And while
25 you're doing that explain to me a little bit how the

1 problem, the inherent difficulty with defense-in-depth
2 as a safety strategy is its unbounded.
3 In other words, if I have one containment,
4 why not two? And if I have two, why not three? If I
5 have one redundant system, why not a diverse of
6 redundant system? And then why not another one if
7 defense-in-depth -- how does your strategy bound
8 defense-in-depth, not so much at the containment level
9 but at the lower levels?
10 MS. DROUIN: Okay. Well, let me try and
11 do these one at a time.
12 MEMBER POWERS: Sure.
13 MS. DROUIN: Okay. The first one was, you
14 know, uncertainties. I truly believe you have defense-
15 in-depth because of uncertainties. Now that leads to
16 the question of what kind of uncertainties are you
17 talking about. And I'm not talking about the
18 uncertainties that are in your PRAs in terms of data.
19 This is more to me, you know knowledge.
20 There's just some things that we just
21 don't know about. And I don't know how you say anymore
22 than that, because how do you talk about what you
23 don't know? But we don't everything. So to make
24 absolute decisions based on your risk on being able to
25 quantify everything, you can't quantify or you can't

1 analyze, whatever the word you want in there, what you
2 don't know. So you do need something there to address
3 the things you don't know.
4 Equally, and I think it's been shown, that
5 sometimes we think we know something or we think we're
6 able to model something and our knowledge was
7 incomplete. And that could be done to unknowns. But
8 it was just not accurate. And so you could make
9 decisions based on the wrong information because your
10 information wasn't accurate. So you need defense-in-
11 depth I'm a firm believer.
12 MEMBER WALLIS: But as you get more
13 knowledgeable, don't you need less of it?
14 MS. DROUIN: Yes. But then that kind of
15 almost gets to Dana question, how do you know --
16 MEMBER POWERS: When you know enough.
17 MS. DROUIN: -- how much that void is.
18 You know, you don't know the size of the void. I
19 mean, but hopefully you know as --
20 MEMBER WALLIS: When I look at the thermal
21 shock study, which is an example of probably good work
22 done here, what they did was to put in a lot more
23 knowledge and a lot more probabilistic stuff and try
24 to get rid of the stuff we don't know, so that we can
25 make a better decision.

1 MS. DROUIN: Yes. Yes.

2 MEMBER WALLIS: And presumably that's the
3 way you ought to be driving to do away with the need
4 for defense-in-depth.

5 MS. DROUIN: Yes, you should. I don't
6 disagree with that. Okay, now --

7 MEMBER POWERS: I think you do disagree
8 with that.

9 MS. DROUIN: Huh?

10 MEMBER POWERS: Because again you're at
11 the size of the void problem.

12 MS. DROUIN: But I think you can get a
13 little bit educated on the void problem. I think to
14 think that we're smarter today than we were 2000 years
15 ago about some things.

16 MEMBER APOSTOLAKIS: Light water reactor.

17 MS. DROUIN: And I would like to think
18 that 4000 years from now they'll be smarter. So to
19 say we're totally ignorant on the void I think is not,
20 you know, accurate. But there is some uncertainty
21 there.

22 I just lost my train of thought.

23 So given that premise, I'm going to go
24 back to Reg. Guide 1174 for a moment that talked about
25 defense-in-depth philosophy and then they had these

1 principles.

2 What we've tried to do in the framework is
3 suddenly a little different. Because in Reg. Guide
4 1174 it came in with a basic assumption that the
5 current body of regulations provides adequate defense-
6 in-depth and it doesn't define it. So it's come in
7 with saying we have defense-in-depth in there and it's
8 adequate, but now as we make changes to the plant we
9 want to make sure we don't degrade whatever this
10 defense-in-depth is.

11 The framework is different because now
12 we're trying to say explicitly what defense-in-depth
13 is, why have you put something there for defense-in-
14 depth. So that say you got the plant design and
15 you're 10/20 years from now and you want to make a
16 change, you can -- now you know that if I may a change
17 there, I'm making it on a defense-in-depth versus
18 right now I don't know what it is. It's this unknown
19 thing, I just know I have it. So it's different from
20 that versus now you're trying to design a set of
21 regulations and you want to make sure you have
22 adequate defense-in-depth. Now you really have to
23 have a need for being a little bit more definitive of
24 what you mean by defense-in-depth.

25 So given that we tried to take a shot at

1 that. And our shot was to do it in two approaches.
2 Start first with, okay, in identifying what
3 requirements you need for this Part 53. We're going
4 to try and identify those. I mean we could have
5 started off and said, okay, we're going to start from
6 design, operation, maintenance. But we didn't start
7 there. We wanted to start from a defense-in-depth
8 approach that says we're going to look at from you
9 don't want to maintain stable operation, and then ask
10 the subsequent questions. Well, if we don't have
11 stable operation, you want systems. If you don't have
12 this, than this to carry you all the way through from
13 challenging the plant design to ultimately having
14 releases.
15 So that was trying to now be complete.
16 MEMBER POWERS: There's a reason I think
17 you're my hero.
18 MS. DROUIN: I'm sorry?
19 MEMBER POWERS: That's just a tremendous
20 answer. I really appreciate that answer.
21 MS. DROUIN: Am I finished?
22 CHAIRMAN KRESS: I want to make a comment
23 on the ten --
24 MEMBER APOSTOLAKIS: I thought the
25 question was why two and not three. That was not

1 answered.

2 CHAIRMAN KRESS: I'm going to answer that

3 one.

4 MS. DROUIN: He told me he was happy, so

5 I'm going to stop.

6 MEMBER POWERS: You have given an

7 understanding of the first question.

8 MS. DROUIN: Okay.

9 MEMBER POWERS: On how you're viewing

10 defense-in-depth when you say your definition of

11 uncertainties encompasses what I think is the biggest

12 uncertainty that we have, and that is the fact that

13 not only are there things that we don't know, but

14 there are things that we're probably wrong about now.

15 MS. DROUIN: Yes. And I could tell you,

16 you know you look over time and I can go back to if

17 you look at WASH-1400, our understanding of accidents,

18 which was a tremendous progress, still had some basic

19 flaws in it that we have learned now, you know, quite

20 a difference.

21 MEMBER POWERS: I mean if you'd come to me

22 and said, gee, it's based on uncertainties and I go

23 through and I do this parameter variations and I find

24 out what areas uncertain in, that's where I put

25 defense-in-depth, you know I'd probably be throwing

1 heavy objects at you and things like that. But, no,
2 I think we agree very strongly in the view.
3 The struggle that I've always had is that,
4 not for the containment because that's a very
5 understandable thing and it's understandable if I have
6 one and not two, and things like that, even though the
7 Germans like two, it's in the more microscopic
8 applications. Particularly in electrical engineering
9 aspects and some of the plumbing aspects where people
10 come in and justify something based on defense-in-
11 depth that I worry about bounding. And, you know,
12 where is it that we have enough knowledge in PRA to
13 say, no, we can decide this strictly on a risk
14 assessment basis?
15 For instance, you might argue, say, the
16 reactor protection system is an area that we have
17 enough knowledge that we know, you know having two
18 diverse ones is enough. We don't need three. One
19 might argue that. There's been a recent event that
20 may dissuade you of that. But --
21 MS. DROUIN: I'll be honest. I don't
22 think we have a good answer to that. And I think that
23 if you look at, for example, the evolution of the ATWS
24 rule, you know our knowledge of how the RPS worked,
25 and you know I'll talk with boilers because I'm most

1 familiar with that, you know our ability in terms of
2 how we modeled it led us to believe that there was a
3 very reliable system. And now I think if we modeled it
4 with today's knowledge, we would have come up with a
5 different answer. Because we didn't recognize the
6 common cause associated there and you got into the --
7 MEMBER POWERS: Reactor scram, just
8 discharge volumes.
9 MS. DROUIN: The discharge volume. Thank
10 you. And we didn't model that. And that now a better
11 understanding of that today would have led us.
12 So here to me is an example of not a full
13 knowledge, things that we thought we didn't quite know
14 as well as we thought we did. I think we're going to
15 always be challenged with that kind of stuff.
16 So what we're hoping is that whereas in
17 the past when you look at Part 50, you know I think
18 defense-in-depth was approached in somewhat an ad hoc
19 manner. This sounds, you know because we're not sure
20 here, let's put things in. We've tried to be, maybe
21 not successfully, but we've tried to approach it in a
22 systematic structured way that would hopefully get to
23 some of that stuff.
24 MEMBER POWERS: Yes. I think you're on the
25 right track. Define what things you think are

1 defense-in-depth, sometimes they're actual structures,
2 sometimes they're things like Tom is talking about,
3 which are not structures but the way you approach
4 things.
5 MS. DROUIN: So that's why where I
6 started. You know we had the strategies, we could
7 have just stopped there. But we didn't stop there.
8 And the next part was coming in and saying okay, we've
9 got at a high level these strategies which are
10 defense-in-depth at a high level. But now to go down
11 to the lower level was let's define principles. And
12 then how should each of those principles be met for
13 each of those strategies.
14 MEMBER POWERS: Okay.
15 MS. DROUIN: So that was the approach in
16 trying to address both of those that we took.
17 MEMBER POWERS: Can you chat with me just
18 a little bit about how you see QA/QC in this mix of
19 risk information and defense-in-depth?
20 MS. DROUIN: Say that again.
21 MEMBER POWERS: How do you see Appendix B,
22 QA/QC sort of things in this mix of defense-in-depth
23 and risk?
24 MS. DROUIN: Well, when we go back -- you
25 know, we didn't get to that. And maybe we should spend

1 some time talking about that -- is the safety
2 classification, you know, in your special treatment
3 which is getting in Appendix B. Maybe we should talk
4 about that now.
5 MR. KING: Yes. But QA is not part of our
6 defense-in-depth limits. QA is a good engineering
7 practices that applies across the board. And that's
8 how it shows up in the framework.
9 MEMBER WALLIS: Can I add something to the
10 defense-in-depth discussion and how much it needs to
11 be? You have trouble I think with the simple question
12 that you get from the public on how safe is this
13 design. Even from the technically informed public.
14 How safe is this design? If you show me an FC curve,
15 a positional type, I can understand what it is that
16 you're trying to do when you say I've done everything
17 I possibly can to make sure that this design meets
18 this FC curve. Then I understand what you have is some
19 indication of how safe it is.
20 CHAIRMAN KRESS: Absolutely.
21 MEMBER WALLIS: But if you say I've put in
22 a lot of defense-in-depth, that doesn't tell me
23 anything about how safe it is.
24 MS. DROUIN: Well, the defense-in-depth
25 was not to answer that question.

1 MEMBER POWERS: She does it in a different
2 approach it seems to me.
3 MEMBER WALLIS: Well, I know. But the
4 public is asking a question.
5 MS. DROUIN: Right. But we have an answer
6 to that and we have defined, you know, safe is safe
7 enough is that you've met the QHOs.
8 CHAIRMAN KRESS: Only with the design.
9 MEMBER WALLIS: With defense-in-depth?
10 MR. KING: You can take credit for the
11 defense-in-depth measures when you do that.
12 CHAIRMAN KRESS: Let's talk about this QHO
13 stuff again, because Dana asked about where I come up
14 with ten reactors on a site.
15 Suppose I had an FC requirement that was
16 approximately equivalent of a CDF of ten to the minus
17 four and a LERF of ten to the minus five. Supposedly
18 those are derived back from the QHOs for
19 representative sites.
20 MEMBER POWERS: Which does not make sense.
21 CHAIRMAN KRESS: Yes. If I had a design
22 just to meet that, that means I put one plant on a
23 representative site, it meets the QHOs. I can't put
24 more than one. So I can't put it on a site that
25 already has reactors on there because you already

1 exceed the QHOs.

2 So I say well let's make the design a

3 little better than that so I could put economic

4 plants.

5 MEMBER POWERS: You're making an economic

6 decision. You're a stock broker.

7 CHAIRMAN KRESS: No.

8 MEMBER POWERS: This is not a stock broker

9 agency. This is not a bank board. This is safety

10 organization.

11 MS. DROUIN: Well, I don't agree that you

12 should not be allowed to add -- this is a personal

13 thing. And I'll tell you the opinions differ among

14 the staff. But I personally -- and I want to emphasize

15 personally -- I think that you should be allowed to

16 add at least one plant to an existing site even though

17 that plant might be at the QHOs.

18 CHAIRMAN KRESS: Well, I think we wouldn't

19 disagree with that. But --

20 MS. DROUIN: I don't think you should

21 preclude --

22 CHAIRMAN KRESS: But only if that plant is

23 well designed so that it adds an insignificant

24 increase to that risk, or almost insignificant. And

25 that level to me is not the QHO level, it's a factor

1 of ten below the QHO. Then you can add that to a site
2 that's already got to plants on it. I don't care.
3 Because it's not going to add any more risk to it.
4 And not only that,if you got a pebble bed
5 modular reactor with ten modules, I think each module
6 ought to be designed with one-tenth of the -- it ought
7 to be designed with the CDF of ten to the minus five,
8 each module and a LERF of ten to the minus six. And
9 therefore you got ten modules and you meet the QHOs
10 with all ten of them.
11 MR. KING: There is a policy issue on this
12 very subject. But the Commission hasn't taken action.
13 MEMBER APOSTOLAKIS: The Commission was
14 split.
15 CHAIRMAN KRESS: I know.
16 MR. KING: And I think the staff's
17 position now, Mary you can correct me, is that on a
18 site basis you've got to figure in the cumulative
19 effects.
20 MEMBER APOSTOLAKIS: Yes, of course.
21 MR. KING: And you grandfathered the
22 existing plants. But for any new ones.
23 MEMBER APOSTOLAKIS: Yes.
24 MS. DROUIN: I mean our recommendation is
25 the SECY paper that we went forward on integrated risk

1 that an existing site where, you know plants already
2 existed, those are in essence grandfathered. And
3 they're grandfathered because we have said they're
4 safe.
5 CHAIRMAN KRESS: Yes, but I think you're
6 making a mistake there. Because if I were the public
7 living around one of those sites, I would say, "Okay.
8 I've already accepted those two plants that are there
9 now, even though I'm at higher risk than I should be.
10 But I don't want you to build another one there. Find
11 another site."
12 MS. DROUIN: Well, we understand that. I
13 have to tell you that when we went to the Advanced
14 Reactor Steering Committee because there was the
15 public perception of how to -- there was issues with
16 both. Whether you factor in the risk from the existing
17 plants or not, you're going to have a challenge to
18 explain to the public. And it was unanimously across
19 all the -- across the entire members of the Steering
20 Committee that in the end they felt that they could
21 explain the fact that they've grandfathered the
22 existing plants.
23 Now for new plants, you know, you would
24 look at the integrated risk. Whether if you want to
25 put one plant there or ten plants there, you're going

1 to have to look at the total integrated risk.

2 CHAIRMAN KRESS: I think in general some

3 sites you shouldn't build another plant on, whether

4 it's a very insignificant addition to the risk or not.

5 MS. DROUIN: For what --

6 CHAIRMAN KRESS: We need to identify which

7 ones of those sites there are. And there are probably

8 about six or seven of them.

9 In order to identify those I think you

10 need some site criteria that talks about the societal

11 risk, for example. And you need to exclude those sites

12 from having another plant on it, even though a new

13 plant may have an insignificant risk addition. I think

14 that's just good public relations. I think the public

15 understands that.

16 What you can do is just not add to the

17 risk.

18 MEMBER APOSTOLAKIS: Can we change the

19 subject a little?

20 CHAIRMAN KRESS: Yes, that's a different

21 subject.

22 MEMBER APOSTOLAKIS: I have two comments.

23 One addresses what Graham raised.

24 Before we go to that subject specific, in

25 the existing certification process because the

1 applicants propose the use of active systems that are
2 non-safety related, whether it's a safety related
3 system or passive, we have this regulatory treatment
4 of non-safety related systems. But one of the things
5 that they're expected to do is to do a circled focused
6 PRA in which you only take credit of the safety
7 system. Does the framework address any of this or is
8 that too much for the framework?
9 MS. DROUIN: Well, the framework if you're
10 going to take credit for the structure system or
11 component in terms of meeting your required -- if
12 you're trying to meet the frequency consequence curve
13 or whatever quantitative goal that you're required
14 ultimately to meet, then that becomes safety
15 significant.
16 Now how much treatment it would get would
17 be relative to how significant it is. But it would be
18 -- you know, we don't use the term in the framework,
19 you know safety related or important to safety. We use
20 the term risk significant. What is that?
21 MEMBER APOSTOLAKIS: But you're not
22 requiring a PRA where certain things are assumed not
23 to be there?
24 MS. DROUIN: No. If you take credit, like
25 for example in today's PRA where you go in and see

1 CDFs and LERFs of certain value, they've taken credit
2 for a lot of non-safety related equipment. You know,
3 boilers across the board take credit for the surface
4 water cross tie. They take credit for the fire system.
5 For a lot of systems that are not safety related, but
6 it's one of the reason why their CDFs are so low
7 because they take credit for all this stuff. And the
8 position in the framework, if you're going to start
9 taking credit for this stuff because you're
10 identifying your licensing base events because of
11 that, well then that is now going to become part of
12 your safety significant components.
13 MEMBER MAYNARD: But there are other
14 regulatory coverage of a lot of those systems. So
15 calling something safety related isn't all that magic
16 in itself. You have other rules, the maintenance rule;
17 things that you consider important to the overall
18 operation of a plant from a safety standpoint. Some
19 of the non-safety related systems that are credited in
20 mitigated accidents are covered under the maintenance
21 rule and other provisions.
22 MS. DROUIN: Yes, I understand that.
23 Right.
24 Now because in the framework they're
25 deemed safety significant, they don't all being

1 required under the framework the same treatment. So
2 the treatment is grade relative to how important they
3 are. And that's where we start bringing in the
4 importance measures and stuff like that to determine
5 to what extent, what kind of treatment they should
6 receive.
7 CHAIRMAN KRESS: Why don't you explain to
8 us how you're going to determine that SSCs in the new
9 framework? That would be a good place --
10 MS. DROUIN: Okay. Why don't we just -- I
11 know John's just been chomping at the bit to get to
12 those. So we did have a couple of viewgraphs --
13 MEMBER APOSTOLAKIS: And that's in fact
14 one of the things I didn't understand with EPRI. They
15 say that that's a difference between them and you.
16 And I just don't understand what the difference is.
17 MEMBER WALLIS: When you talk about safety
18 significant SSCs?
19 MEMBER APOSTOLAKIS: Yes, that's what
20 they're going to talk about.
21 MEMBER WALLIS: Now you just, Mary, that
22 you don't have any safety significant SSCs. They're
23 only risk significant. You said that about a minute
24 ago.
25 MS. DROUIN: Yes. But I said I couldn't

1 remember my exact words. I know we didn't call them
2 safety related or important to safety. I was trying
3 to remember exactly. And we call them safety
4 significant.
5 MEMBER WALLIS: Yes, but that means risk
6 significant, doesn't it?
7 MS. DROUIN: Yes.
8 MEMBER WALLIS: Now did you ever question
9 why you have these at all?
10 MS. DROUIN: I don't understand your
11 question.
12 MEMBER WALLIS: Well, if the plant is
13 meeting is safety objectives, then it would seem to me
14 that maybe the plant management needs to have a way of
15 monitoring or choosing or evaluating things which are
16 more important to risk. But why do you have to step
17 in and say you're going to monitor all these things?
18 Why should you define certain things as being safety
19 significant? I mean, the plant designer and manager
20 knows that certain things are significant for safety
21 and presumably takes care of them. Why do you have to
22 step in and regulate them all?
23 MEMBER POWERS: It's the most important
24 thing that comes out of the PRA.
25 MEMBER WALLIS: Well, we know that. We

1 know that. The PRA will tell you that. It's telling
2 the plant that, too. So why does the Government have
3 to go in and --
4 MEMBER POWERS: Because sometimes the
5 plant doesn't get involve --
6 MEMBER WALLIS: Oh, because you can't the
7 trust to do it, is that what it is?
8 MEMBER APOSTOLAKIS: Because there is an
9 assumption there that there is such a safety culture
10 out there.
11 MEMBER WALLIS: That's right. There's an
12 assumption that the plant isn't going to do it.
13 MEMBER APOSTOLAKIS: And that is not
14 something that you can defend very well.
15 MEMBER WALLIS: I just wonder if you
16 really need to do it this way.
17 MS. DROUIN: Well, we were not proposing--
18 MEMBER APOSTOLAKIS: Ideally, yes, you're
19 right.
20 MEMBER POWERS: Apparently so.
21 MS. DROUIN: I mean, we were not proposing
22 to not have any special treatment requirements. So
23 once we made the assumption we're going to have
24 special treatment requirements, then what are those
25 requirements and what do you impose them on?

1 MEMBER POWERS: Now the question comes out
2 how you select these things.
3 MS. DROUIN: Exactly. I thought that --
4 MEMBER WALLIS: And?
5 MS. DROUIN: The answer.
6 MR. LEHNER: The way the framework
7 describes how you select the safety significant SSCs
8 is tied to the licensing basis event. The framework
9 says that if you took credit for an SSC in showing
10 that a licensing basis event meets the frequency
11 consequence curve, then that SSC is safety
12 significant.
13 MEMBER POWERS: Isn't that getting us
14 right back into the 40,000 things that are on the Q
15 list?
16 MR. LEHNER: No, I don't think so.
17 MS. DROUIN: No.
18 MR. LEHNER: Well, let me also add that
19 the special treatment, as Mary said earlier, the
20 special treatment is not necessarily the same
21 treatment for all the SSCs that are safety
22 significant. The special treatment is supposed to
23 reflect the fact that the SSC is reliable under the
24 conditions that you took credit for when you did the
25 PRA.

1 MEMBER WALLIS: So you have a PRA and it
2 says her's a pump, and it has a certain reliability.
3 And when you push a button it will start a certain
4 percentage of the time and so on. Well, that's in the
5 PRA already, isn't it?
6 MEMBER POWERS: And here's the problem I
7 see, Graham, is that he says if you took credit for it
8 in your licensing basis event, then you got to treat
9 it as a safety significant --
10 MEMBER WALLIS: So you got to check that
11 what you have in your analysis, it's the same with
12 reality.
13 MEMBER POWERS: Well, what we know is
14 what's in the PRA is a very small fraction of this.
15 This is a large set of things of which only a very,
16 very small fraction is actually in the PRA.
17 MEMBER WALLIS: So how can they take
18 credit for it in their -- in the LBEs, if the LBEs
19 come from the PRA then?
20 MEMBER POWERS: Because you say look, I'm
21 going to turn this thing on, and the system works. So
22 the system is made up of a bunch of components, there
23 are a bunch of things that allow you to turn it on.
24 I mean, the ratio is about -- there are about 2000
25 things in the PRA, there are about 40,000 that end up

1 being counted here. I mean, it's a huge ratio of
2 things that are not in the PRA
3 MEMBER CORRADINI: In terms of the rare
4 number of reliability.
5 MEMBER POWERS: Yes, things you have to be
6 aware of.
7 MEMBER CORRADINI: It's an accumulative --
8 it's a system level reliability.
9 MEMBER APOSTOLAKIS: But that will bring
10 us -- I mean if they declare all these components as
11 safety related, we're going back to the arguments of
12 the special treatment. And that was a major complaint
13 that just because the diesel is safety related, that
14 doesn't mean the little component down here of the
15 2000 subcomponents of the diesel should be safety
16 related, too. And we have this mechanism of a scheme
17 with importance measures.
18 But I think Graham's question is more
19 philosophical. He says, fine, these are important.
20 But why should we care about it? Let the plant
21 management take care of them. And I think the answer
22 to that is that we don't trust them, period. I mean,
23 that's the truth.
24 MEMBER WALLIS: But the point is to what
25 degree should you interfere with?

1 MEMBER APOSTOLAKIS: We don't trust them.
2 MEMBER WALLIS: To what degree should --
3 MEMBER APOSTOLAKIS: To go down to look at
4 40,000 different things and check them all?
5 MEMBER BONACA: I don't think it's a
6 question of trusting. I think it's a question of what
7 requirements do you expect to have implemented. There
8 is always debate about, for example, what requirements
9 do you need to support something.
10 MEMBER APOSTOLAKIS: There is always a
11 difference in trust.
12 MEMBER BONACA: And in the debate you have
13 come to an agreement of what is a reasonable approach
14 and then what you do that --
15 MEMBER APOSTOLAKIS: Absolutely.
16 MEMBER BONACA: -- becomes what you do.
17 MEMBER APOSTOLAKIS: That was in Ohio,
18 Davis-Besse. I think there is an issue of trust as
19 well.
20 MEMBER MAYNARD: I agree with Mario,
21 though. I don't think this is a matter of trust.
22 There are issues you may have specific plants or
23 whatever. It's a matter of what is the regulator's
24 responsibility to the public and the ability to
25 demonstrate that. And it has nothing to do with

1 trust.

2 MEMBER SHACK: Yes. I mean we have chosen

3 to make this a regulated industry.

4 MEMBER MAYNARD: Right. Right.

5 MEMBER SHACK: And then you have to decide

6 what it is you're going to regulate.

7 MEMBER POWERS: And Congress said that the

8 NRC will assure. And so NRC's got a job to do just

9 like the plant management does.

10 CHAIRMAN KRESS: But there is a question

11 of why tie it to the licensing basis events? Because

12 those aren't reality. Why not use importance measures

13 that come out of the PRA and --

14 MS. DROUIN: Why?

15 CHAIRMAN KRESS: Huh?

16 MS. DROUIN: Why?

17 CHAIRMAN KRESS: But why isn't that the

18 only thing you use? Why go back to the LBEs when

19 that's the important is how they contribute to the

20 actual risk, which is the PRA. Why not just use

21 importance measures and the PRA to decide on the

22 safety significant?

23 MEMBER POWERS: You don't get enough --

24 you don't cover all systems.

25 MEMBER BONACA: Well, the other thing is

1 that PRA, I mean if you focus on CDF, you know
2 addressing some of the issues. For example, you have
3 an expectation, you told the MOVs which perform during
4 accidents would be tested to demonstrate that they
5 will operate under the conditions at which they are
6 designed to operate. And so therefore, you impose
7 certain requirements on those MOVs even if an MOV only
8 leads you to, say, it's for an AOO, for an anticipated
9 operational occurrence.
10 I mean so the failure of the MOV to
11 operate, you may have a barrier after that that says
12 well nothing much is happening there, but still is
13 important for this concept of defense-in-depth, for
14 example.
15 MS. DROUIN: I mean, to me probably the
16 two major differences here that's different than what
17 we're doing today is that, you know, we just have two
18 categories. And don't come up with four categories.
19 And so I think that's a major difference.
20 Doing that forces -- the reason you had
21 those four categories is because you do have things
22 that people are taking credit for in the PRA. Sorry.
23 You have things that the PRA is showing
24 risk significant that didn't get labeled safety
25 important, important to safety. But also one of the

1 reasons some of these plants are as reliable as they
2 are is because they are taking credit for things that
3 aren't showing up as important -- identified as
4 important to safety. And so if they degrade or they
5 aren't maintained, then the risk would not be as low
6 as it is.
7 MEMBER BONACA: But going back to that
8 statement I made, naturally I am confused now.
9 For South Texas they have gone through the
10 approach of taking some components which were safety
11 related, and now they're none safety significant.
12 Therefore, they removed. And the criterion they used
13 really was that CDF and -- CDF. And here in this
14 approach, however, you have other goals other than
15 CDF--
16 MEMBER SHACK: No. They have an integrated
17 process. That's right. 50.69 that is supposed to
18 include considerations of things that I think are --
19 you hope are built into the LBE decisions here.
20 MS. DROUIN: Right.
21 MEMBER BONACA: But they really didn't do
22 that way.
23 MEMBER SHACK: Well, I don't know exactly
24 what they did, but --
25 MEMBER MAYNARD: I personally think we

1 should move more away from the old fashioned safety
2 related. I think it's more important to -- you know,
3 how do you treat the -- what's needed to assure that
4 you have the equipment when you need it? And a lot of
5 these gets to be performance-based. And, again, I get
6 back to the maintenance rule, there's certain
7 surveillance tests and stuff that I think are far more
8 important than what pedigree you may have purchased
9 something or whether you carry it on a Q list or not.
10 MS. DROUIN: And we agreed with you. And
11 that's what this third bullet is meant to imply, is
12 that we aren't saying that because everything is
13 safety significant that it has to all be the same
14 pedigree. You know, we're just saying okay what are
15 those group of components that we're going to just --
16 you know, either they need to be monitored, need some
17 pedigree, need something in between, whatever. So
18 we're just trying to capture that group of components,
19 and that group of components is we're saying those
20 have some significance to safety.
21 MEMBER MAYNARD: But if you credit it in
22 your PRA, you should do something that provides some
23 level of assurance that it's going to have the
24 reliability that your seeing.
25 MS. DROUIN: That's exactly the approach

1 we've done here. Now at the end, though, we now use
2 the risk importance measures to determine to what
3 degree do they need to be looked at.
4 MEMBER POWERS: The trouble I have is that
5 in the South Texas experience by far and away most of
6 the decisions on which box to put things in could not
7 be made from the PRA. They could only be made by this
8 expert panel that they set up. And it was an
9 engineering judgment, and in fact I think a very good
10 engineering judgment because many people would
11 identify a component as, right, that's got to be there
12 and it's got to be high quality, even though it
13 doesn't show up in the PRA.
14 MR. LEHNER: We do state that you can add
15 SSCs that require special treatment based on
16 engineering judgment, not just on a PRA. In other
17 words, the PRA is not the sole --
18 MEMBER POWERS: I bet I'd do that all
19 right. If I had a plant, I'd just love to have them on
20 your list. I might put them on my list, but I'm not
21 sure I'd put them on your list voluntarily.
22 MEMBER WALLIS: Well, PRAs should be a
23 living thing. If you have a valve which is soon to be
24 95 percent efficient in the PRA and it's allowed to
25 deteriorate to the point it's 50 percent efficient,

1 there ought to be some mechanism where that is
2 recorded and you have a living PRA that lets you know
3 that you have effected risk profile by letting this
4 valve deteriorate.
5 MS. DROUIN: Exactly.
6 MEMBER SHACK: That's usually not the
7 problem, however.
8 MEMBER WALLIS: That ought to show up.
9 And then you do something -- that's an indication that
10 you should have done something about it.
11 MS. DROUIN: And that's why we have --
12 MEMBER WALLIS: Is that what happens here?
13 MS. DROUIN: Yes.
14 MEMBER WALLIS: Well then you just need
15 the PRA then. You just need the PRA. You don't need
16 to have a separate category of stuff.
17 MEMBER POWERS: That's not usually the
18 problem, Graham. The problem is usually that the
19 system is not called upon to perform. You don't know
20 that the valve is degraded because it only gets
21 activated once every plant lifetime.
22 MS. DROUIN: But just requiring a living
23 PRA doesn't accomplish it. You have to tell them,
24 okay, you got a living PRA. Now you got to require
25 them to go and reassess this. Just before you say

1 "Hey, I living PRA," you got to tell them what to do
2 with it.
3 MEMBER WALLIS: But if you have a living
4 PRA -- having a living PRA sort of implies that you
5 are reassessing all the time and the reliability of
6 all your safety systems.
7 MS. DROUIN: No.
8 MEMBER POWERS: It doesn't imply that.
9 MS. DROUIN: It doesn't imply that to me.
10 MEMBER WALLIS: Well, that's what living
11 PRA means to me.
12 MS. DROUIN: The living PRA just means
13 that you're maintaining that PRA. It doesn't mean
14 that you're making decisions on what you do with the
15 results of that PRA.
16 MEMBER WALLIS: Well, the fact that you've
17 assumed a valve has a certain reliability in your PRA
18 is fixed for eternity? The fact that something
19 happens to that valve or it's not maintained --
20 MS. DROUIN: But it's not fixed for
21 eternity.
22 MEMBER WALLIS: -- has no effect at all?
23 MEMBER APOSTOLAKIS: Well, in principle --
24 MS. DROUIN: You do your PRA on, say, year
25 one, okay. Five years later -- let's just say it's a

1 five year update they have to do. And you know the
2 reliability of that's changed. And now you've got
3 different rankings coming out. Just because you've
4 done that assessment, where's the requirement that
5 says you have to go do something with that
6 information.
7 MEMBER APOSTOLAKIS: The maintenance rule
8 forces you to do that, among other places.
9 MS. DROUIN: Well, that's my point.
10 That's -- you had another rule. Just having a living
11 PRA itself doesn't force you to do something.
12 MEMBER APOSTOLAKIS: It doesn't do
13 anything.
14 But I have two questions. One is are we
15 discussing the points you raised earlier? That's what
16 the schedule says, or is a free discussion about --
17 CHAIRMAN KRESS: Well, we started out the
18 meeting today --
19 MEMBER APOSTOLAKIS: Okay. But I think we
20 should go back. Because there are some points that
21 you might --
22 CHAIRMAN KRESS: You're welcome to go in.
23 MEMBER APOSTOLAKIS: But I an answer,
24 because this question keeps coming up. I mean Graham
25 asked the question what do you tell the public when

1 they ask you how safe it is. I don't think there is
2 an answer to that. I think the answer is the same
3 that this agency has used for a long time, which you
4 can state in different ways. But if a plant has gone
5 through the process of licensing, then it is safe.
6 MEMBER WALLIS: Well, how do you get
7 credibility?
8 MEMBER APOSTOLAKIS: In other words, a
9 safety case has been made. These are the magical words
10 that they use.
11 MEMBER WALLIS: Trust us. Trust us is --
12 MEMBER APOSTOLAKIS: Well, it's not just--
13 well, in a sense, yes.
14 MEMBER WALLIS: Trust us.
15 MEMBER APOSTOLAKIS: In a sense. But the
16 safety case is not the result of a single thing.
17 Okay. It's not the result of the PRA. It's not the
18 result of the maintenance rule. It's a number of
19 things. And they're struggling now in the waste, the
20 Yucca Mountain thing, to build safety cases where they
21 actually use those words.
22 But for me, I'll take an example. The
23 ESBWR. You go and you look at the PRA. They did it
24 so the core damage frequency -- now does anybody
25 believe that? Has anybody come up with --

1 MEMBER POWERS: Yes, right.

2 MEMBER APOSTOLAKIS: -- a counter
3 argument, for example, they assume a probability or a
4 reliability of unity for all the passive systems. So
5 people say well this can't be true, but nobody can
6 come up with an argument why it cannot. But then they
7 do the focused PRA, they take out all the active
8 safety systems and they still get, I don't know, ten
9 to the minus five. Then they assume a few other
10 things. You know, sensitive studies. In my mind this
11 builds the safety case.

12 In other words, I really don't what the
13 core damage frequency is, maybe it's not three times
14 to the minus eight. But I know it's not three times to
15 the minus four. Because I have seen all these analysis
16 and I know that they're also doing other things,
17 regulatory requirements and so on.

18 So the final answer is yes, that -- if you
19 ask me is it safer than existing reactors? I would
20 say yes. How much safer? I can't tell you. But I
21 think it's safer, because I've seen all these studies.

22 So the answer is never a number. It's the
23 result of all these analyses, regulations, defense-in-
24 depth, meeting defense-in-depth requirements. And I
25 think we have to recognize it.

1 Now, the old saying was if it meets our
2 regulations, it's safe. Sort of cyclical there. But
3 there is a hell of a lot of truth in that.
4 MEMBER POWERS: Well, that sounds like--
5 MEMBER APOSTOLAKIS: If it meets our
6 regulations, it's safe.
7 MEMBER POWERS: To be precise is that we
8 presume that it provides adequate public protection.
9 MEMBER APOSTOLAKIS: Right. Right. There
10 is a presumption which means we allow it to operate.
11 MEMBER WALLIS: But then any place can say
12 that. I mean, the former Soviet Union said exactly
13 the same thing.
14 MEMBER APOSTOLAKIS: Right. So you really
15 have to look at what makes up the safety case. And it
16 seems to me with risk we have increased the knowledge
17 base. But it's always a safety case. It's never a
18 single thing.
19 MEMBER MAYNARD: I think it goes beyond
20 just saying it meets regulations. I think our process
21 is open to the public for public scrutiny for how did
22 the rules get developed. And there's a lot more that
23 goes behind the regulations.
24 MEMBER APOSTOLAKIS: Sure.
25 MEMBER MAYNARD: The margins that are

1 required to be in various areas and stuff. So I think
2 it's more than just a trust me it meets the
3 regulations.
4 MEMBER APOSTOLAKIS: No. But at the end,
5 though, Otto, you're saying trust me. I have made the
6 judgment. I mean that's the truth of it.
7 MEMBER WALLIS: Trust me because NRC --
8 MEMBER APOSTOLAKIS: I took all these
9 things into account and I declare, you know --
10 MEMBER POWERS: The gold standard.
11 MS. DROUIN: Right. But if you did not say
12 that the regulations provided for adequate protection,
13 then what's the basis for --
14 MEMBER APOSTOLAKIS: Yes.
15 MS. DROUIN: -- granting them a license?
16 MEMBER APOSTOLAKIS: Right. Right.
17 MS. DROUIN: Because you're not adequately
18 protecting the public.
19 MEMBER WALLIS: Well, when I go in for
20 surgery and I've talked to a good surgeon, he doesn't
21 say trust me.
22 MEMBER APOSTOLAKIS: Oh, he does.
23 MEMBER POWERS: Yes, he does.
24 (All speak at once).
25 MEMBER APOSTOLAKIS: He's so elegant, he's

1 not even certain of that.

2 MS. DROUIN: He didn't even ask a

3 question.

4 MEMBER POWERS: He's so arrogant, he

5 doesn't even ask you.

6 MEMBER WALLIS: Well, the last time I had

7 surgery, I had a very good discussion with the guy

8 about the possibilities of this and that and so on.

9 And he sounded as if he understood these things. He

10 didn't say trust me.

11 MEMBER APOSTOLAKIS: It's presumed.

12 MEMBER POWERS: Come on.

13 MEMBER WALLIS: Anyway --

14 MEMBER SHACK: You have a better doctor

15 than I have. Mine just stares at me and says trust

16 me.

17 MEMBER MAYNARD: They all make legal

18 disclaimers now in fact that something could go wrong.

19 MEMBER BONACA: Actually, a PRA could be

20 good also in medicine. I mean, you could ask them to

21 perform a PRA.

22 MEMBER POWERS: No. There's too much error

23 of commission.

24 MEMBER CORRADINI: So I want to know, Mr.

25 Chairman, where are we in this -- yes, where are we

here.

MS. DROUIN: I request that we take a break.

CHAIRMAN KRESS: We're at a break time. And then we're going to come back and maybe talk a little more about design stage versus operational stage. It's on the agenda. I don't know what it means.

MS. DROUIN: We are on the technical acceptability.

CHAIRMAN KRESS: Okay.

MEMBER APOSTOLAKIS: I really would like to --

CHAIRMAN KRESS: Yes, go ahead.

MEMBER APOSTOLAKIS: I'd like to also hear the comments that you received in your response. I mean, you summarized it earlier, but I mean there is a response -- no the comments. I really want to know whether other people raised the important --

MEMBER POWERS: I couldn't give a damn. I don't care.

MEMBER APOSTOLAKIS: Well, I do.

MS. DROUIN: Okay. Let me just answer, we have not gone through and finished doing that. So we're not beyond what I told you this morning in those

1 viewgraphs in terms of the detailed comments on all
2 the technical issues. We're still sorting through
3 that. You know, the only comments that we've been
4 able to sort through and summarize are the ones that
5 dealt with the issues we brought up this morning. We
6 have not done yet, we are not finished with what
7 you're asking for, George.
8 MEMBER APOSTOLAKIS: We will write our
9 letter May?
10 CHAIRMAN KRESS: I don't recall what the--
11 we have on this month's agenda.
12 DESIGNATED FEDERAL OFFICIAL FISCHER: Just
13 to remind the Committee what the purpose of the
14 meeting was supposed to be, we're supposed to be able
15 to respond to an SRM item that came out your meeting
16 with the Commission in October. And the SECY suspense
17 date is end of May. And the task is to provide the
18 Commission with your views with respect to the staff's
19 work on the technology-neutral framework with a focus
20 on ensuring the value of such an approach versus the
21 development of a licensing framework for specific
22 designs, such as high temperature gas cooled reactor
23 or a liquid metal cooled reactor. That's the task.
24 This relates in an abstract sense to that,
25 but we need really to focus on which is the best

1 strategy to moving forward. And I think the closest
2 we came to that today was when Stu was talking. But
3 we need to focus on the different options and the pros
4 and cons so that we can articulate to the Commission
5 why we're proposing what you guys would like to
6 propose.
7 MEMBER WALLIS: We haven't heard that at
8 all.
9 MEMBER APOSTOLAKIS: When is the letter
10 due, though.
11 DESIGNATED FEDERAL OFFICIAL FISCHER: The
12 letter is due May 31st.
13 MEMBER APOSTOLAKIS: And what is the plan
14 now? To write it at the May Committee, their meeting?
15 DESIGNATED FEDERAL OFFICIAL FISCHER: Tom
16 drafted up a letter that we can use as a starting
17 point. I don't think -- well, we are required to
18 respond until May 31st.
19 We do have plans to talk with the staff
20 about the SECY paper that they're planning to send
21 forward to the Commission with their recommendation on
22 how to proceed. And that's supposed to happen in May.
23 And one of the things I put int he status
24 report was you guys may want to wait until you've had
25 the benefit of that presentation before you formally

1 respond to this SRM item. But it would be nice if we
2 were working on the response to this SRM item between
3 now and May.
4 MEMBER APOSTOLAKIS: So what you're saying
5 is that today's meeting did not address the real
6 question?
7 DESIGNATED FEDERAL OFFICIAL FISCHER: No,
8 it does.
9 CHAIRMAN KRESS: It's information that you
10 can use to make your judgments.
11 MS. DROUIN: We did go through before you
12 came in, George, if you go back to viewgraph --
13 MEMBER APOSTOLAKIS: Somehow, whenever I'm
14 late, all the important issues are discussed before I
15 come in.
16 MEMBER POWERS: Well, you were very late,
17 George. But what's surprising, George, is how quickly
18 we moved through them.
19 MS. DROUIN: But in terms of, you know we
20 did not -- because we're still sorting through the
21 details on the technical stuff, but in terms of the
22 merits, you know, moving forward in the framework, we
23 did give you a summary of that, which were these
24 slides here. Going through whether we should have
25 this Part 53. You know, here was kind of a summary of

1 the comments. I mean, they were generally supportive
2 about moving forward. I'm going to put generally
3 supportive, because it's kind of hard to separate some
4 of these things out because they're so interrelated.
5 You know, whether it should be technology-neutral,
6 technology-specific. You know, there was a mixture of
7 use there.
8 MEMBER APOSTOLAKIS: Oh, this is like an
9 ACRS discussion.
10 MS. DROUIN: I can't give you what wasn't
11 said. This is what was said and the -- you know,
12 whether or not we should go to rulemaking, the general
13 consensus from all the comment was don't go to
14 rulemaking right away. It's premature. You know test
15 some things out. Develop some implementing guidance.
16 Do some pilots. You know, I mean they all
17 characterized it in a different way, but it was
18 generally don't do it right now. Don't even not do
19 it, just don't do it right now.
20 MEMBER WALLIS: Well, to get back to
21 Dave's question, I mean I can't imagine licensing new
22 reactors without something like this framework to
23 decide what to do. You can't just say we're going to
24 license this thing without some structure like this.
25 MS. DROUIN: Well, and I think that's what

1 we heard from the public.

2 MEMBER WALLIS: No matter what.

3 MS. DROUIN: Just don't make it a

4 rulemaking.

5 MEMBER WALLIS: So I don't understand what

6 the alternative is. What's the alternative?

7 MS. DROUIN: Work some of this out.

8 MEMBER POWERS: Well now what you're

9 telling me is that we could not have licensed Fort St.

10 Vrain.

11 MEMBER CORRADINI: No, he didn't. He's

12 saying we didn't license Fort St. Vrain.

13 CHAIRMAN KRESS: No, we did.

14 MEMBER CORRADINI: I know we did.

15 MEMBER POWERS: We could not have

16 certified the FFTF Clinch Rover. But Clinch River

17 never really got done.

18 MEMBER WALLIS: We have to have some

19 basis. We have to have some basis.

20 MS. DROUIN: I think there's really just

21 one question on the table. Because the question is if

22 you do it under -- right now if you're going to

23 license something it's going to be under Part 50. The

24 question is are you going to approach this given

25 exemptions and additions with a deterministic hat on,

1 so to speak?

2 MEMBER SHACK: This Committee?

3 MS. DROUIN: Are you going to do Part 50

4 using more and allowing them to use a probabilistic

5 approach? So I mean to me that's the fundamental

6 question.

7 MEMBER APOSTOLAKIS: No. Because even when

8 the rule is deterministic, this information is used.

9 So you're just formalizing it a little better. But the

10 truth of the matter is that there is a mixture, the

11 basis is deterministic and I think that's the way it's

12 going to be for the foreseeable future.

13 MEMBER WALLIS: The question, George --

14 MS. DROUIN: But you've already made the

15 decision it's risk-informed.

16 MEMBER APOSTOLAKIS: Which one?

17 MS. DROUIN: You've made the decision it's

18 risk-informed?

19 MEMBER APOSTOLAKIS: Yes. Yes.

20 MEMBER POWERS: And it can't be, and I

21 agree with him on that. And the question is where is

22 the balance?

23 MEMBER APOSTOLAKIS: Yes, where is the

24 balance?

25 MEMBER POWERS: We see in license and

1 power uprates --

2 MEMBER APOSTOLAKIS: Yes, exactly.

3 MEMBER POWERS: There is no risk at all.

4 MEMBER APOSTOLAKIS: The rule is

5 deterministic, and yet there is always someone --

6 presented our distinguished our guests here.

7 MEMBER POWERS: And actually in power

8 uprates it's worse than that. Not only is there not

9 any risk, that that is risk is the wrong risk to apply

10 because it's core damage frequency and it doesn't

11 really change.

12 MEMBER APOSTOLAKIS: That's right.

13 CHAIRMAN KRESS: I think we're at a part

14 where we need to take a break.

15 MEMBER APOSTOLAKIS: Yes.

16 CHAIRMAN KRESS: We'll come back and

17 decide on what to talk about.

18 Are we on the agenda for the full

19 Committee?

20 DESIGNATED FEDERAL OFFICIAL FISCHER: Yes,

21 we are.

22 CHAIRMAN KRESS: It may just be a blank

23 spot. But we need to decide.

24 (Whereupon, at 3:05 p.m. a recess until

25 3.26 p.m.)

1 CHAIRMAN KRESS: We're ready to get
2 started again.
3 Where are we, Mary, do you know?
4 MS. DROUIN: I've not a clue. We're at the
5 end, and everybody's happy. Did I sell that?
6 CHAIRMAN KRESS: Is there anything else
7 you want to talk about right now or anything Members
8 think we haven't touched on enough yet and want to
9 bring up.
10 George is not here.
11 MEMBER CORRADINI: The two aren't here.
12 MEMBER MAYNARD: Well, I do think it would
13 be worthwhile to talk a little bit about why this
14 approach and not technology-specific, since that's one
15 of the questions that we really got to answer. And I
16 don't know, maybe they've covered that.
17 CHAIRMAN KRESS: You wanted to say a few
18 words about that, Mary?
19 MS. DROUIN: Yes. I'll try to just give
20 you what our vision was.
21 MEMBER CORRADINI: Can I broaden his
22 question, though?
23 MS. DROUIN: Absolutely.
24 MEMBER CORRADINI: All right. Because my
25 only thing is I had missed this part, but about what

1 is going to be carried forward. It seems to me I'm
2 back to the empiricism of testing it. And you said you
3 tested it with the ALWR with a particular plant. I'm
4 thinking of --
5 MS. DROUIN: No, a light water reactor.
6 MEMBER CORRADINI: Right. I'm sorry. A
7 light water reactor. Excuse me.
8 But I think going on what with Otto was
9 saying is it seems to me the next thing up is the
10 NGNP. It would seem logical to somehow flush this out
11 and the practicalities of it relative to that, and
12 it's a new plant. And simultaneously I would expect,
13 and so my question is, can this be done in parallel?
14 Because I get the impression it will be more empirical
15 and more historically based on how the NGNP may
16 proceed forward. But if this would be carried along
17 and flushed out along that way, would that not be of
18 benefit to you? That's kind of my part of the
19 question.
20 MS. DROUIN: Okay.
21 MR. MONNINGER: This is John Monninger
22 from the staff within our Research.
23 And I think one things that is important
24 to recognize here is we have with the help of the
25 Committee, the ACRS, you know stakeholders out there

1 have been developing the framework for several years.
2 And in any project as the project goes on you're able
3 to address certain issues within a certain amount of
4 time with a certain level of effort. And then you have
5 more difficult issues and you're not quite sure what
6 direction to pursue on some of these issues. And so
7 there is a thought, you know we haven't reached any
8 firm conclusions, there is a thought though that we
9 have made significant progress with the framework. And
10 the question is where do we take the framework from
11 here forwards.
12 Do we keep to pursuing these issues on a
13 technology-neutral basis without any specific
14 applications in front of us, without any specific
15 designs? Is there some way we could facilitate
16 resolution of these issues in a more productive
17 manner?
18 I guess at the same time we recognize that
19 within the staff we are working with DOE in
20 development of this NGNP licensing strategy. At the
21 same time we're having interactions with PBMR on the
22 white papers. At the same time you have the GNEP
23 program. So whereas at one time when we were working
24 this, those three other programs weren't in place. Now
25 we recognize that there are these other programs that

1 the framework could potentially contribute to.

2 So you know the potential notion is should

3 we pursue more these other programs and see to what

4 extent the framework could contribute to those

5 programs? So that's what the thinking is currently.

6 It hasn't been vetted totally throughout, but at one

7 time it was just the framework and now we have other

8 projects to develop, licensing strategies coming on at

9 the same time. I mean, do you really want to run down

10 three paths at the same time? Do you want to be

11 developing the NGNP licensing strategy, pursuing the

12 framework and at the same doing something for GNEP?

13 You know, shouldn't there be something that is the

14 lead runner there and that some of these programs

15 somehow dovetail together.

16 We also have a high temperature gas

17 reactor research plan. And in there there's -- you

18 know. So I think what is happening is we're

19 recognizing that there is a need out there to define

20 a path forward and we're trying to pull these programs

21 together.

22 Does that make sense?

23 MS. DROUIN: And adding on to that, I

24 think we got to go back and visit history a little

25 bit. You know, why was this program implemented and

1 where were we trying to take it? And where we were
2 trying to take first is where we are now, and John hit
3 very well on those things, is now do we have to change
4 part of it because where we thought we trying to go
5 and how you use this framework. And I really want to
6 emphasize the word "how."
7 I mean if we go back to 2003, you know
8 there was the recognition of all these policy issues
9 for advanced light water reactors. You know, the
10 policy issues on how do we address enhanced safety?
11 How do we deal with defense-in-depth? Probabilistic
12 approach to the licensing basis? Source term,
13 mechanistic source term? I'm missing three more. But
14 you know there was a whole catalogue of these policy
15 issues that move forward as we start looking to the
16 future for advanced reactors. And in doing that we
17 said, okay, and the Commission came back and told us
18 to move forward with five of them. And in trying to
19 deal with these policy issues, you know, we had also
20 said that it made more sense to create this new -- we
21 called it a Part 53 for just lack of a better word.
22 Would be to create a new regulatory structure for
23 licensing these advance non-LWRs. You know, it just
24 didn't seem to be efficient. Not that you couldn't do
25 it under Part 50, because you could. But it just

1 seemed to be more efficient and more effective and you
2 would get to being able to maintain stability, produce
3 stability under this new regulatory structure for
4 these advance non-LWRs than this old one.
5 So that's kind of where we went off was,
6 okay, now to create this document, this framework that
7 would be used as the technical basis for this new Part
8 53. We had thought out at the time in laying out the
9 ground rules, because we had a lot of ground rules in
10 places where we trying -- and that's all documented in
11 all this stuff.
12 I've got another whole book that's like
13 that thick of all the SECY papers and things that have
14 been created over the last 3½ years. But in doing
15 that one of the complaints or problems that we went
16 back and looked at the current Part 50 and in risk
17 informing it. Also that over time as we became more
18 knowledgeable and while a rule was written at the time
19 made sense based on the knowledge we had at that time,
20 that as we got more knowledge and wanted to refine a
21 rule, it make it more difficult because you were
22 dealing in rule space.
23 So since we were going into an arena of
24 reactors that we knew less about, the premise was that
25 if we could create these rules as best we could to the

1 same scope and depth of the current but try and keep
2 them more neutral so that as we gained more knowledge,
3 that we wouldn't have to go back into a rulemaking to
4 bring that new knowledge into the regulatory
5 structure. We would get those specifics in regulatory
6 guides. And so as we gained more stuff we would be
7 changing regulatory guides and not rules.
8 So that was kind of a vision of where we
9 were trying to go with all this. Personally, I don't
10 think that's been a difficult challenge. The challenge
11 has been, you know, bring in this probabilistic
12 approach form the very beginning, you know, starting
13 with a clean sheet of paper, integrating risk from the
14 ground up.
15 And to me today's a good example that's
16 where the challenge is. We've been all over the place
17 in trying to come to grips. And I'll tell you over
18 the last 3½ years that frequency consequence curve has
19 been all over the place.
20 CHAIRMAN KRESS: It seems to me like the
21 ACRS in his SRM that it's been charged with answering
22 has been given two options. And I don't like either
23 one of them.
24 One option is stop work on the framework
25 and instead -- I mean it's really one option. Which

1 of these you want? Stop work on the framework and go
2 to a specific application or I think -- they want our
3 opinion on that. And it seems to me like do you have
4 to? Can't you do both? I mean are we so limited in
5 resources that we can't go to a specific application,
6 and continue working on this framework until we got it
7 really the way we wanted it?
8 MS. DROUIN: Well, I think the problem is
9 semantics here. And do you stop where you are here?
10 The answer is a yes and a no. I think we can publish
11 this document the way it is.
12 CHAIRMAN KRESS: I wouldn't.
13 MS. DROUIN: Now --
14 CHAIRMAN KRESS: I would recommend against
15 that.
16 MS. DROUIN: I'm sorry?
17 CHAIRMAN KRESS: I would recommend against
18 that because I think you need a little bit of
19 polishing and a few items that you need to straighten
20 out.
21 MS. DROUIN: Yes.
22 CHAIRMAN KRESS: But, you know, it's not
23 far. You're close.
24 MS. DROUIN: I think we're very close. But
25 I think what we should be doing next is trying to vet

1 these issues out now and how you actually apply them
2 and use them. And, you know, if you go back. I don't
3 know if you remember that famous figure. At one time
4 we had this figure that shows that this whole thing
5 was this four phased program. And the first phase was
6 to develop the framework. The second phase was to show
7 an example set of requirements. We've done that. The
8 next phase was to develop an implementing guidance
9 document of how you take this and implement it. And
10 then the next phase was bringing all of this together
11 and go to rulemaking.
12 Now, where we are and what the stakeholder
13 comments have said it's premature to go to rulemaking.
14 I don't disagree with that.
15 CHAIRMAN KRESS: Yes, I don't disagree
16 with that.
17 MS. DROUIN: Because I think that second
18 phase, or the third phase -- I can't remember what
19 number it was, which was to develop the implementing
20 guidance document. And that's where it really gets
21 into the details of this stuff.
22 You know, the details that you all are
23 looking for are correct, but they aren't meant to be
24 in this document. They're meant to be in the
25 implementing document, which we have not started. I

1 think we ought to go to that one. And in doing it, you
2 know, take a real plant design, whether the BMR or
3 whatever. Now then you can take that and say, okay,
4 if that's working, and I don't think that's years of
5 effort. I think that can be done in a year.
6 CHAIRMAN KRESS: Yes.
7 MS. DROUIN: And then you take that and
8 say now does it make sense if it turns out that it's
9 working and we're able to work all these issues out,
10 then do we develop a regulatory guide to support
11 licensing these things under Part 50 using the
12 concepts from the framework?
13 MEMBER WALLIS: Well, to apply to the SRM,
14 I think you'd have to look at what would happen if you
15 applied this framework to, say, the BMR. What would
16 happen if you tried to do it without this framework?
17 You might well find that when you try to do it without
18 the framework you're forced to do many of the same
19 things.
20 MS. DROUIN: Absolutely.
21 MEMBER WALLIS: Which would be really
22 reenforcing your framework.
23 MEMBER MAYNARD: Yes. I think the way the
24 Commission posed the question to us shows a different
25 understanding of what the purpose of the technology-

1 neutral framework is all about. I kind of get the
2 impression they think that you either issue a rule for
3 each specific design or you issue a rule for
4 technology-neutral, that that rule itself would
5 license any type of plant. And that's really not the
6 case.
7 The technology-neutral framework is going
8 to be a process, whether you use the existing
9 regulations and use this process for where you take
10 exception, or whether you develop different rules for
11 each technology, it's the framework by which you start
12 making the decisions. So I don't see it as one of
13 where you stop one to do the other or vice versa. I
14 think it's an important framework and it's going to be
15 used whether additional rules are developed later or
16 whether you use it for exemptions to the current rules
17 as a process.
18 CHAIRMAN KRESS: I agree.
19 MEMBER MAYNARD: You're not going to
20 license any plant under this framework. It's not going
21 to come out with a set parameters that you submit
22 something and say "I meet it, and therefore I should
23 get my license."
24 MS. DROUIN: Well, I agree and disagree
25 with what you said. I agree in the sense that the

1 circumstances have changed. I do think that the
2 Commission was asking based on the history and all the
3 communication that we've had in the SECY papers. And
4 they've been very detailed and I think very -- I don't
5 think there's been misunderstanding. And I think the
6 Commission was asking very specifically should we
7 develop this Part 53. You know, because that's always
8 been where we've been going. And if you go back and
9 you read the whole series of SECY papers, I think
10 that's where they were asking. And that's why they
11 wanted us to go and do this ANPR, should we be
12 developing this Part 53 and should it be technology-
13 neutral, or if we do develop this new Part 53, should
14 we go specifically and make it specific to a reactor
15 technology.
16 Now my personal opinion is I don't think
17 you need to go to technology-specific. You certainly
18 could. There's no reason you have to do a technology-
19 neutral.
20 I mean my personal recommendation is going
21 back of why we wanted to go technology-neutral is
22 because we are going to learn more things and to go
23 back to change rules is a very tedious process. We're
24 dealing with that right now in risk informing Part 50,
25 and it's very tedious. Whereas if the details can be

1 regulatory guides and you're regulatory guides in the
2 future. So our vision always was to have the
3 regulations neutral and have the details, the
4 technology specific details in regulatory guides.
5 Now people have said oh well that's not a
6 requirement. That is a requirement. That's part of
7 your license. But it is easier to change a regulatory
8 guide than a rule.
9 MEMBER CORRADINI: I guess I'm reading the
10 words that we were -- I guess we're kind of still
11 talking about the framework but also talking about the
12 SRM and what we're somehow tasked to do, come hell or
13 high water.
14 In reading the quote they really do say
15 "verses." And I guess I would dodge --
16 CHAIRMAN KRESS: Yes, that's the word.
17 MEMBER CORRADINI: I would dodge the
18 charge in the sense that I think that the framework
19 can be neutral, but the application will never be
20 neutral, right? I mean --
21 MS. DROUIN: What do you mean by
22 application?
23 MEMBER CORRADINI: Hang on there. Well,
24 the application is because you got a reactor and it's
25 cooled by gas, and it's got a lot of graphite. And

1 there's certain characteristic accidents that you got
2 to worry about. And the application of the technology-
3 neutral framework to this specific design or design
4 class will be specific. You're going to have to get
5 into the nitty-gritty.
6 MS. DROUIN: Absolutely. But that
7 application can be that the regulation is neutral. The
8 regulatory guidance is specific. The combination is
9 technology-neutral.
10 MEMBER CORRADINI: Okay. I hear you. I'm
11 not sure in the time frame if I believe that the EPAC
12 2005 relative to NGNP if a neutral regulation can be
13 promulgated, vetted, agreed upon, blessed and
14 instituted before they start down their path.
15 So putting that aside, I guess the reason
16 I'm saying this is more not towards you guys, but
17 really towards our action item is I guess I'd dodge it
18 and basically recommend what you guys have been kind
19 of going along, which is we got to continue with the
20 development of the framework because this is the
21 philosophical underpinning, but I would apply it in a
22 pragmatic way with the current rules. Because I don't
23 see how we have any choice given the time frame.
24 CHAIRMAN KRESS: Yes, I think that's the
25 kind of a position I would come down on it. And I

1 think Mary agrees with it.

2 MS. DROUIN: And I agree with that.

3 CHAIRMAN KRESS: Yes. Okay.

4 Yes, I think that's kind of going to be

5 our tentative answer to that.

6 MS. DROUIN: But this is where I think

7 it's a matter of semantics. When I talk about

8 framework, I'm talking about NUREG-1860.

9 CHAIRMAN KRESS: Yes, I understand. Yes.

10 MS. DROUIN: Minor polishing, but it's a

11 new document that you're creating when I talk about

12 this implementing guidance document a lot of these

13 issues out. And it's that guidance document, you know

14 maybe with a regulatory guide that would support the

15 current Part 50.

16 CHAIRMAN KRESS: Yews. I think that's

17 needed, too.

18 MS. DROUIN: And I think when you use the

19 word "framework," I think you need to be careful

20 whether you mean it in this big global sense or

21 whether you mean NUREG-1860.

22 CHAIRMAN KRESS: Well --

23 MS. DROUIN: Some people interpret that

24 word "framework" to mean 1860 and some people mean it

25 in a broader sense.

1 CHAIRMAN KRESS: Well, I like to interpret
2 it as being 1860.
3 MEMBER BONACA: Yes, me, too.
4 CHAIRMAN KRESS: But I think it's
5 important that you have this implementation guidance.
6 MS. DROUIN: I don't disagree.
7 CHAIRMAN KRESS: So what I would like to
8 see is I don't think you're quite ready to publish
9 1860 the way it is. I think it needs a little bit more
10 work. But it's awfully close. And then publish that
11 and at the same time be working on the implementation
12 guidance. I'm not sure for which specific design, but
13 I would probably chose the PBMR because I think you
14 have all of the relevant inputs for that right now
15 through the white papers and the PRAs and stuff. I
16 think it would be an easier implementation guidance to
17 do.
18 MS. DROUIN: Yes. I don't know how to
19 respond to your statement, Tom. I don't disagree with
20 you. I mean, all I can share with you at this time is
21 that the plan is to publish this summer.
22 Now, does that mean that it couldn't get
23 some polishing more done to it to address it? Yes, it
24 could. Have we budgeted for that? Right now, no.
25 CHAIRMAN KRESS: Well, I think the key --

1 MS. DROUIN: Could that change? Yes.

2 CHAIRMAN KRESS: In my mind the key

3 missing ingredient is a final risk acceptance criteria

4 for design. That shouldn't take much to put that in.

5 And I think that's LC curve, a CCDF. And without

6 that, I don't think you have a complete document.

7 MS. DROUIN: Yes. I don't think to address

8 the concerns that I've heard today is difficult.

9 CHAIRMAN KRESS: I don't either, frankly.

10 MS. DROUIN: I don't think it is.

11 CHAIRMAN KRESS: I saw saving points.

12 MS. DROUIN: I really don't. But all I

13 know is what I have in terms of the budget in terms of

14 getting this published. And what's in my budget is to

15 do tech editing at this point. Now is it a lot more

16 money to do what you want to do? No. But, you know,

17 I can't squeeze, what is it, blood out of a turnip or

18 whatever the saying is?

19 MEMBER CORRADINI: Water out of the stone.

20 MS. DROUIN: That, too.

21 CHAIRMAN KRESS: How do we get you more

22 budget? I got a quarter I could --

23 MS. DROUIN: Talk to Mr. Monninger. I

24 will put him on the spot and I shouldn't do that.

25 Because he's very supportive of this.

1 CHAIRMAN KRESS: I mean, this framework
2 is so important for having what I would call coherence
3 in the whole regulatory system, not just new plants.
4 And it's so important for the future certification of
5 any kind of design that I think it's going to be
6 foolish to not make this framework document as
7 complete as possible and make it a really good
8 document that you want to serve the purpose. And I
9 think you're close. I think it would be crazy to stop
10 now.
11 MEMBER BONACA: Because it seems to me
12 also that you know on the implementation document,
13 this is a repository of a lot of thinking --
14 CHAIRMAN KRESS: It's a repository of the
15 whole concept.
16 MEMBER BONACA: -- which is consistent
17 with the whole position to reach -- so I don't think
18 anybody who was going to design a new plant would
19 ignore it. In fact, they will pay a lot of attention
20 to it.
21 CHAIRMAN KRESS: That's right.
22 MEMBER BONACA: You know, even if you
23 don't have a requirement or an implementation
24 document. Just because they know which the NRC is
25 going to think in terms of licensing a new plant. You

1 know, it's an important document.

2 CHAIRMAN KRESS: It's too important of a

3 document I think to quit work on right now.

4 MS. DROUIN: I don't disagree, but I'm not

5 the one that makes that decision.

6 CHAIRMAN KRESS: Well, at least we can

7 pass on what we think to the Commissioners. You know,

8 I can't speak for the Committee. Maybe the rest of the

9 Committee doesn't agree with me.

10 MEMBER POWERS: Tom, what we know from

11 experience that license several reactors, Peach Bottom

12 1 were done in a previous era -- CRS really did them.

13 The ones we know about are Port St. Vrain and the

14 certification of FFTF. And what we know that things

15 were very ad hoc there. And that decisions had to be

16 made. They were made by individuals, they were

17 justified by individuals. In any agency there's a lot

18 of oversight in that. So it wasn't really a

19 completely capricious sort of thing, but they were

20 still very ad hoc.

21 And without a document like this you're

22 going to continue that really ad hoc fashion. And I'm

23 not sure that the Commission really wants to face the

24 public confusion that would come about from an ad hoc

25 kind of approach. And I think we have to impress upon

1 them that, yes, maybe time schedules are pressing on
2 them. You know, but there's always time to do things
3 over, there's never time to do it right.
4 CHAIRMAN KRESS: Yes.
5 MEMBER POWERS: And that just can't be
6 their situation here. You just got to go ahead and
7 finish this thing up and then go ahead and pursue it.
8 And I don't think I would devote a whole huge amount
9 of time to testing it against particular plants. I
10 would go to driving it forward to completion.
11 CHAIRMAN KRESS: Yes, I couldn't agree
12 more.
13 MEMBER POWERS: And extension on and
14 whatnot.
15 I agree with you, let's go ahead and
16 publish it. I would do it with just the editing
17 because you're going to revise it as you get into
18 things anyway. And every time you do something in
19 connection with this risk=informed application you're
20 going to learn something and become smarter, and
21 you're going to go back and iterate. It's not going
22 to be a straight line process.
23 MS. DROUIN: Right. And I mean I think
24 that in terms of polishing it, I think that polishing
25 can take place in the implementing guidance of it. I

1 don't think it has to actually appear, you know, like
2 adding -- not everything has to appear necessarily in
3 that document. That can be an outcome of implementing
4 it that we need that curve in there.
5 MEMBER APOSTOLAKIS: I think we should
6 polish it as we polish any document that is issued by
7 this agency. And I agree that it will be polished as
8 you try to apply it. But if you know how to polish it
9 now, you can polish it now.
10 We always try to issue --
11 MS. DROUIN: So I can send you the bill?
12 CHAIRMAN KRESS: Yes, sure.
13 MEMBER POWERS: I'll tell you what we do
14 with bills from the Government. MIT is so wealthy
15 with its endowment, they can probably cover the whole
16 thing and not even -- just out of their coffee fund.
17 MEMBER WALLIS: Well, if you're going to
18 polish it, and this --
19 MEMBER APOSTOLAKIS: No. I mean this is
20 your polishing. But anyway, sorry. Go on.
21 MEMBER WALLIS: That's fine, George. I
22 think polishing is fine. But I think that it's not to
23 the point where there aren't going to be ways to
24 improve it. And I agree with Dana that we need
25 something rather than an ad hoc approach to all these

1 future plants. This is a first draft. It's a good
2 thing. I think there are ways to improve it and that's
3 why I'm concerned about this decision to stop work.
4 MEMBER APOSTOLAKIS: I am, too, yes.
5 MEMBER WALLIS: As if it's finished. This
6 is it. The Commission should be told that this is a
7 great first step. There's some good ideas here. It's
8 going to save a lot of work down the road, but that
9 there will probably be revisions to it.
10 MEMBER APOSTOLAKIS: I see there is a
11 problem here, though. Because usually when the agency
12 proposes a new way of doing business, there is always
13 a pilot or two. I don't know how you can have a pilot
14 here because you can't use a real application, right?
15 And how else can you get a pilot? I mean I don't
16 see--
17 CHAIRMAN KRESS: You know they kind of had
18 a pilot in the appendix with the LWR. To me they
19 tested the thing out and said with an LWR in the
20 appendix and said we arrive at this same place or we
21 arrive somewhere different. And I think that was a
22 good test. I don't think you need --
23 MEMBER APOSTOLAKIS: No, but you really
24 need a future design, that's when the real issues
25 would be. I mean, in existing LWR --

1 CHAIRMAN KRESS: Yes. But the question is
2 that's not a pilot. You're going to go to a future
3 design, you're going to -- there's no doubt you can
4 implement this. I don't see any reason why not. And
5 you're going to come up a design basis, license basis
6 event. You can do everything that's in there, but
7 what have we found out?
8 MEMBER APOSTOLAKIS: I think you're going
9 to have issues --
10 MEMBER WALLIS: Why do you do a pilot--
11 MEMBER APOSTOLAKIS: --the same way you
12 had the issues when we looked at special treatment
13 requirements and so on. The industry comes back and
14 they try to apply it, and they have comments. And the
15 staff gets comments. And there is nothing special
16 about this that you will not have any issues like
17 that. I mean, that's what you do. That's how you
18 learn.
19 CHAIRMAN KRESS: But I think the only
20 chance of doing that is the BMR.
21 MEMBER APOSTOLAKIS: No. Because it will
22 be a real application.
23 CHAIRMAN KRESS: BMRs aren't real? I
24 mean, they --
25 MEMBER APOSTOLAKIS: Because it's real, it

1 cannot be a pilot.

2 CHAIRMAN KRESS: They'll come in with the

3 license application --

4 MS. DROUIN: Let's talk about the word

5 "test" versus the word "pilot." You know, testing,

6 you're just testing something in terms of kind of

7 looking at feasibility. To me when you use a pilot and

8 if we look at 50.69 for example, that was a real

9 application that was piloted under that rule.

10 MEMBER APOSTOLAKIS: Okay. Tell me how you

11 would get your test.

12 MS. DROUIN: So --

13 MEMBER APOSTOLAKIS: There is no way.

14 MS. DROUIN: -- here the problem is you

15 certainly can't pilot it against the 53 because the 53

16 hasn't been written.

17 Now you could pilot in terms of writing

18 the new rule if you wanted to license this under a new

19 -- I mean, I can't see anybody jumping up and

20 volunteering that. So then the question is do you

21 pilot it in developing regulatory guide to support

22 licensing under Part 50.

23 MEMBER ABDEL-KHALIK: Correct.

24 MS. DROUIN: And that could be a real

25 pilot with a real plant. It's no different, and I'll

1 use something, I'll use Reg. Guide 1.200. We issued
2 1.200, then we had pilots come in with real
3 applications under which we piloted and tested 1.200.
4 MEMBER APOSTOLAKIS: My point is that
5 these are all very different from what you're trying
6 to do here. If somebody has a design and they come
7 here requesting a license, they want decisions.
8 MS. DROUIN: Yes.
9 MEMBER APOSTOLAKIS: 1.200 we will go and
10 review the PRA. Sure, do it. Let's do it, you know.
11 We find things. We have a nice meeting in San Diego.
12 It's not the same thing.
13 MS. DROUIN: George, I'm just talking
14 about the process. You can pilot something with a
15 real application.
16 MEMBER APOSTOLAKIS: And my point is that
17 in this case getting that real application will be
18 very hard just to test the framework. Very hard.
19 MS. DROUIN: I think that I don't see
20 someone volunteering to do it. Not that it can't be
21 done.
22 MEMBER APOSTOLAKIS: Oh, of course it can
23 be done.
24 MS. DROUIN: I'm not saying it can't be
25 done. It can be done.

1 MEMBER APOSTOLAKIS: Well, of course it
2 can.
3 MS. DROUIN: I don't see someone
4 volunteering because it's going to extend the time.
5 It's going to make it more costly and will int he long
6 term, will that save them something? I don't know.
7 We can put Ed Burns on the spot.
8 MEMBER APOSTOLAKIS: The infamous
9 regulatory instability.
10 CHAIRMAN KRESS: Well, he wants to make
11 some comments. Let's hear what he has to say.
12 MR. RUBEN: And Ed can follow me up if he
13 likes.
14 One of the things that I've been involved
15 also is in the PBMR pre-application review of the
16 white papers. And the white papers as a collection in
17 a way is the risk-derived approach to adopting Part
18 50. So there are many of the same kinds of issues and
19 they have their approach. And they have piloted that
20 with our design, okay.
21 We could take our technology-neutral
22 framework approach and walk in the footsteps with our
23 design and their PRA and see what we would come up
24 with in the way of design basis accidents, safety
25 related systems, defense-in-depth. It would be a

1 comparison. It would be a comparative analysis of the
2 framework and our framework.
3 CHAIRMAN KRESS: And I think you could
4 almost do that right away, and I think that would be
5 a good choice.
6 MS. DROUIN: Yes, we could.
7 MEMBER APOSTOLAKIS: But is anybody --
8 MS. DROUIN: But that is separate from the
9 review of the PBMR.
10 CHAIRMAN KRESS: Sure.
11 MEMBER APOSTOLAKIS: Right. And is anybody
12 willing to fund this?
13 CHAIRMAN KRESS: Ah.
14 MEMBER APOSTOLAKIS: I agree, this would
15 be the best way to --
16 CHAIRMAN KRESS: It has to be funded by
17 NRC.
18 MS. DROUIN: Well, I thought you were
19 sending the bill to MIT.
20 MEMBER APOSTOLAKIS: Sorry? We will fund
21 it?
22 MS. DROUIN: Well, yes.
23 MEMBER APOSTOLAKIS: I'll propose that,
24 yes.
25 No, actually, this is an excellent

1 opportunity. Because the PBMR people have --

2 MS. DROUIN: Absolutely.

3 MEMBER APOSTOLAKIS: -- submitted these

4 white papers, it gives you an opportunity to do this,

5 to test your methodology without really having the

6 pressure of an actual application.

7 CHAIRMAN KRESS: Yes. That's what I was

8 saying.

9 MEMBER APOSTOLAKIS: But you will need

10 some funds to do this.

11 CHAIRMAN KRESS: That's right.

12 MEMBER APOSTOLAKIS: You told us that you

13 are all stopping activity. So that worries me.

14 CHAIRMAN KRESS: Yes.

15 MEMBER WALLIS: I think there's another

16 problem --

17 MEMBER APOSTOLAKIS: Can we recommend

18 that?

19 CHAIRMAN KRESS: We can. We can do all

20 sorts of things. Nobody has to listen to us.

21 MEMBER APOSTOLAKIS: It won't be the first

22 time.

23 MEMBER WALLIS: The framework isn't just

24 advice for the agency about how to license. It really

25 is advice for designers about how to design. Because

1 you've got all the requirements in here which they
2 have to meet by their design. So it's rather difficult
3 to apply it to a design which is being produced
4 without knowing what the framework was going to be.
5 In way --
6 MEMBER APOSTOLAKIS: Well, the framework
7 has been in various guises, has been now for years
8 now, right, Mary? It's not that we developed --
9 MEMBER WALLIS: Do you think the PBMR are
10 being designed in order to meet a framework like this?
11 MS. DROUIN: Well, remember -- remember --
12 MEMBER APOSTOLAKIS: But they knew. They
13 knew it existed.
14 MEMBER WALLIS: If that's the case, then
15 maybe you can do it.
16 MS. DROUIN: Remember the framework
17 indirectly does help licensees. But the framework is
18 the process, the guidelines and criteria for writing
19 these regulations. Okay.
20 Now we have -- you don't have a copy of
21 it, but it was our plan to put this appendix into the
22 summer version. We have turned the crank and we have
23 taken our first shot at applying the framework for a
24 complete set of requirements that would we ultimately
25 move to rulemaking, this would be with the Part 53.

1 So that's what we would be testing, you know, looking
2 at this, how does this fit in in terms of using that
3 to -- if you're going to be licensed under Part 50,
4 well then how does this look to Part 50 and this would
5 serve as a technical basis for making your decisions
6 of, yes, these ruling -- Part 50 applies. These are
7 the exemptions and this is what you need to be doing
8 in addition using a probabilistic approach.
9 MEMBER APOSTOLAKIS: A related thing. I
10 understand that the staff will not issue an SER or the
11 white papers. Is this Committee going to become aware
12 of what the papers are and what your judgment is and
13 maybe give you some --
14 CHAIRMAN KRESS: I think we can -- they're
15 not proprietary. I think you can get copies of them.
16 MEMBER APOSTOLAKIS: No. But I mean in a
17 more formal setting.
18 CHAIRMAN KRESS: That's a good question.
19 MR. RUBEN: Well, I'm not the project
20 manager, but I do believe that we will develop our
21 preliminary evaluation, our assessment of what we
22 think is the right track where we think changes
23 perhaps to be made and will become before this
24 Committee would be my expectation with those results.
25 I'm sure you would have the opportunity to

1 read the white papers and our assessment before we
2 ever met.
3 MEMBER APOSTOLAKIS: I think we have seen
4 already on some of this stuff that you guys are
5 receiving. But it would be nice to have a discussion.
6 MR. RUBEN: Yes. Right now we're in the
7 process as a team to review the white papers,
8 developing our requests for additional information.
9 And I expect we'll be meeting with PBMR --
10 MEMBER APOSTOLAKIS: Is this kind of
11 unusual, Stu? Why did they submit those white papers?
12 MR. RUBEN: Why? Because they informed us
13 that they wanted to submit a design certification
14 application 2008 for the PBMR. In advance of that
15 they want us to look at our approach, the use of PRA
16 to develop their licensing basis.
17 MEMBER APOSTOLAKIS: Right.
18 MR. RUBEN: So they put together our
19 safety analysis report reasonably well.
20 DESIGNATED FEDERAL OFFICIAL FISCHER:
21 There is a brief paragraph in the status report on
22 page 4.
23 MEMBER APOSTOLAKIS: Right. I read it.
24 I think it was very well written.
25 DESIGNATED FEDERAL OFFICIAL FISCHER: That

1 must have been by someone else, George.

2 CHAIRMAN KRESS: Okay. I think we're

3 getting near the end of this discussion.

4 And what are you going to do tomorrow,

5 Mary?

6 MS. DROUIN: We are going to come in and--

7 MEMBER CORRADINI: Repeat this?

8 MS. DROUIN: And we were not going to come

9 in tomorrow and have any technical discussion. It was

10 going to be basically, you know, at a high level what

11 were the stakeholder comments and what's our path

12 forward.

13 CHAIRMAN KRESS: Why don't you do that?

14 That sounds like a good --

15 MEMBER APOSTOLAKIS: When would I have an

16 opportunity to recommend my views on margins? A

17 letter?

18 CHAIRMAN KRESS: Yes. You can --

19 MEMBER APOSTOLAKIS: In May?

20 CHAIRMAN KRESS: We may have a letter this

21 meeting.

22 MEMBER APOSTOLAKIS: Interim letter?

23 CHAIRMAN KRESS: Yes. You're welcome to

24 draft something up and let's look at it.

25 MEMBER APOSTOLAKIS: Well, I have to see

1 what the sense of the Committee is.

2 MEMBER WALLIS: It depends on what the

3 sense letter is. I mean if the letter is a

4 preliminary sort of letter with another coming in May,

5 which is more final, I think I might not have

6 comments.

7 CHAIRMAN KRESS: I guess we need to

8 discuss this offline.

9 MEMBER APOSTOLAKIS: Yes, we need to.

10 CHAIRMAN KRESS: Yes. We need to discuss

11 whether we ought to have a letter this time or wait

12 until May and what the nature of it ought to be. But

13 we can do that offline.

14 MS. DROUIN: I mean, it would be nice, and

15 I can't tell you what to do, but --

16 MEMBER POWERS: Oh, yes, you can. Come on.

17 It won't be the first time. Come on, Mary. We've

18 known you for a long time.

19 MS. DROUIN: You know, to me there's two

20 different letters. You know, whatever you want to say

21 about safety margins is certainly welcome. But if we

22 ended up not going anywhere and doing anymore on this,

23 it becomes kind of mute. But if you're going to give

24 us a letter on a technical issue, I'd love to hear not

25 just safety margins but a lot of the kind of things

1 we've touched on today.

2 CHAIRMAN KRESS: I think that's the kind

3 of letter we may put together. Plus, I agree --

4 MS. DROUIN: Of the things you'd like for

5 us to pursue and polish. Maybe that's a kind of good

6 letter, I don't know.

7 CHAIRMAN KRESS: Of course we need to get

8 it down in writing.

9 MEMBER APOSTOLAKIS: I think what David

10 said earlier suggests that maybe the letter that will

11 address the SRM will be in May. An Interim letter on

12 the technical contents of the framework --

13 CHAIRMAN KRESS: I think --

14 MEMBER APOSTOLAKIS: -- which is not what

15 the SRM asks, you can very well write this at this

16 meeting so they will have the benefit of a document.

17 CHAIRMAN KRESS: That's what I think we'll

18 do.

19 MEMBER APOSTOLAKIS: Yes. And I think it's

20 fair to the staff and it's the proper way to proceed.

21 MEMBER ABDEL-KHALIK: As to what we would

22 like to see before they publish this new reg?

23 MEMBER APOSTOLAKIS: Yes, or in future

24 work what they should work on. I mean, it's not --

25 MEMBER WALLIS: Well, the answer to SRM

1 may be very simple. It may be that to avoid ad hoc
2 approaches to all these future reactors, there must be
3 a framework.
4 MEMBER APOSTOLAKIS: I think you're right.
5 MEMBER WALLIS: Yes.
6 CHAIRMAN KRESS: We've had an offer to
7 hear a few words from Areva on the PBMR. I think it
8 would be very interesting.
9 MR. BURNS: If you're willing to do that.
10 MEMBER APOSTOLAKIS: Okay.
11 MR. BURNS: Ed Burns, Licensing Manager
12 for Pebble Bed. It's not quite Areva, but it's
13 international.
14 What we're looking at is the timing in
15 everything else. If we come in with a design cert, we
16 have to deal with the process we have in front of us,
17 and that's Part 50 and Part 52. And we have to deal
18 with it in an efficient manner and with a number of
19 technical issues that are new to the reactor design.
20 But what we look at in terms of pre-application , and
21 we had a number of meetings with the staff and very
22 useful in that, to plan out a series of white papers
23 over a period of the last year, this year that looked
24 at items in the early part, about four white papers
25 were right on top of this topic. But not focusing on

1 the framework, per se.

2 The first paper was on the probabilistic

3 risk assessment. And that is how do you look at a --

4 and I won't use the word living -- but how do you look

5 at a probabilistic risk assessment for a new design

6 from a clean sheet of paper? How do you put together

7 all of the new standards that we have out there since

8 the last five or six years that were not available 20

9 years when the regulations were written? How do we

10 look at, once we get that PRA, how do we use it

11 properly? So then we gave a second paper on licensing

12 basis event selection. And from that if you can

13 follow those events down into a series of families and

14 then pick what is conservative or the design basis

15 accident conservative representative events, sequences

16 from that, and that would be a useful use of the PRA.

17 The safety classification I think has

18 already been talked about. South Texas, the 50.69 and

19 the four boxes. Well if you had a clean sheet of

20 paper, you probably wouldn't want to go that route. So

21 we gave in a third paper that specifically looked at

22 safety classification in terms of a clean sheet of

23 paper. In terms of what Mary's presented here earlier,

24 if there are two classifications plus some additional

25 special treatment for those items that you might want

1 to raise the reliability on.

2 Then we also in December submitted a

3 fourth paper, and that is on defense-in-depth. We're

4 saying okay. We've got a very decent PRA. We think

5 we know how to use it. We think we know how to design

6 this reactor. But in reality we have to step back and

7 ask ourselves from a designer standpoint there are

8 certain things we can put in the design, but from an

9 applicant who is going to use the design there are a

10 number of programs you can bring in. Whether they're

11 maintenance, operations, RT&SS, various other types of

12 programs can bring in, the radiation protection, all

13 the various tech specs and everything. And you can

14 bring a number of programs in that will also work with

15 the design to provide a requisite level of defense-in-

16 depth.

17 And then we added a third thing to that.

18 We said if we've got that good PRA, if we truly

19 believe in it, can we use that to help us take a good

20 clean look at do we have the right design and do we

21 have the right match up of programs to provide an

22 adequate defense-in-depth? We weren't focusing on

23 just the uncertain, the low probability. We're

24 focusing also what the designer is faced with, and

25 that is on the high probability. The normal

1 operations. The AOOs. And as you start moving into
2 the design basis accident region and then as you work
3 through that. So we weren't going from an outside ten
4 to the minus eight look forward, we were going from a
5 normal AOO design basis region outward. And we should
6 be able to get to the same answer if we're both on the
7 same approach.
8 So what we're looking at is the value of
9 the elements of what's inside the framework. Not the
10 overall framework itself, because that's not going to
11 be here in a time that's going to be useful to pebble
12 bed. But the elements of it I think are very useful to
13 us. And we've provided four papers to the Commission
14 for their review.
15 CHAIRMAN KRESS: It sounds like those
16 papers would be very interesting for us to read.
17 Thank you very much. It was useful.
18 Well, I think we may be near the end of
19 today's session. Does anybody have any burning issues
20 they want to bring up before I adjourn this meeting?
21 Anybody want to say anything else?
22 MEMBER ABDEL-KHALIK: Can I just summarize
23 what I think --
24 CHAIRMAN KRESS: Yes, please do.
25 MEMBER ABDEL-KHALIK: I sort of stand.

1 CHAIRMAN KRESS: He's going to summarize
2 for us.
3 MEMBER ABDEL-KHALIK: I think a great deal
4 of thought and effort has gone into this work. And I
5 would like to compliment the staff on a job well done.
6 This is a very written document.
7 MS. DROUIN: Thank you. Plus our
8 contracting team.
9 MEMBER ABDEL-KHALIK: Like most other
10 members here I would be very troubled by the
11 possibility that all work on the framework would be
12 stopped. I would like to be able to capture the
13 knowledge and wisdom that has been gained by going
14 through this process. But before publishing this
15 document, I'd like to see the issues and concerns
16 raised in the discussion here today at rest to make
17 this a truly worthwhile document.
18 And, you know, different members have
19 different specific issues that they would like to see
20 corrected before this is viewed as a complete
21 document.
22 The third thing is as part of this process
23 I do support the idea of putting this knowledge and
24 wisdom to good use by going through this experiment of
25 piloting this process or comparing whatever you're

1 going to get with the process that's being
2 contemplated for the gas cooled reactor.
3 CHAIRMAN KRESS: Excellent summary. I
4 think it wraps up my thoughts --
5 MEMBER APOSTOLAKIS: I think he should
6 write a letter.
7 CHAIRMAN KRESS: I think it wraps things
8 up very well. Thank you very much.
9 Anybody else want to add to this?
10 MEMBER WALLIS: I have a comment.
11 CHAIRMAN KRESS: Oh, okay. Let's hear his
12 comment first and you can respond to both of them.
13 MEMBER WALLIS: Well, I like what you've
14 done. I think there are ways to change it that could
15 improve it. But I think you've come a long way.
16 Really this is the time, I think it's a
17 new era in reactor technology and commercial
18 applications for a breakpoint. We've had these light
19 water reactors and nothing happened for a long time.
20 Now there's a prospect of a whole new set of
21 technology and so on, it's a new era. And I don't
22 think that ACRS having sort of one letter and one
23 meeting is probable the final answer. This is going to
24 be a really important step for the agency. The ACRS
25 needs to mull this over probably for a year or

1 something.

2 So I hope if we write a letter and that we

3 don't say this is the end --

4 CHAIRMAN KRESS: I hope not, too.

5 MEMBER WALLIS: -- that there's a lot to

6 be done. And it may well be that what's actually

7 implemented doesn't look quite like what's in this

8 document that you've presented here, but it's a great

9 first step anyway.

10 MEMBER APOSTOLAKIS: Yes. So that there

11 will be no misunderstandings, I do appreciate the

12 document, the quality of the document and the effort

13 that went into it. I mean the comments that at least

14 I have been making are intended to, my opinion,

15 improve it. I mean it's not that I don't like what I

16 see. I think it's great.

17 I'm really concerned about this statement

18 that the work will stop. And maybe we can recommend,

19 if we agree, that what Stu suggested actually become

20 a formal recommendation: That they use the PBMR for

21 which there seems to be some time without the pressure

22 of an actual application to try some of these things.

23 And maybe even quote McGaffigan. He wanted to see an

24 actual application. I mean, here is an opportunity to

25 do that.

1 So the staff won't just -- as part of its
2 review of the white papers, maybe there ought to be a
3 task of seeing how the framework would apply to these
4 things. Maybe that would be a very -- I would hate to
5 see this work stop. Because I know what's going to
6 happen. The moment there is an application they will
7 see, gee, you know look at the existing regulations.
8 How can we proceed? Because they want a license. They
9 are not interested in developing frameworks, right?
10 So it's up to us collectively to make sure that we're
11 prepared at some point to say "No, we have this
12 approach and we think this is the right way to do it."
13 So the PBMR white papers it seems to me
14 are an excellent opportunity. Maybe it's not the ideal
15 opportunity, but it's a very good opportunity to
16 actually do this.
17 CHAIRMAN KRESS: It would seem to me so,
18 too.
19 MEMBER APOSTOLAKIS: Yes.
20 CHAIRMAN KRESS: Any other comments of
21 Members before Mary?
22 Mary, why don't you make some closing
23 comment?
24 Once again, I second this thing. I think
25 you guys have done a marvelous job. This is an

1 excellent document. And it really represents a real
2 step forward in making a coherent regulations.
3 MS. DROUIN: Well, I think today's been a
4 very productive discussion. I know that the team has
5 heard it, and I know I've said it in public many
6 times, the issues here are very complex.
7 And we go back and forth among ourselves
8 many, many times. As you look over time and you
9 think, well we had this huge document a year ago, we
10 had it two years ago, we had it three years ago. It's
11 not like three years ago we had ten pages and we've
12 done 50 pages. And it's because the technical issues,
13 as every Member here has recognized, are very complex,
14 has a lot of little subtle and nuances. And we are
15 going down a new path.
16 I certainly liked Dr. Wallis' words of a
17 new era. Because I think this is a new era. And do we
18 start down that or do we continue? I like to look
19 five, 10, 20, 30 years down into the future. Do we
20 keep going the way we've been? You know, we have new
21 knowledge, we have no information and when do we start
22 applying those to improve the way we do business or do
23 we still keep driving that old Model-T.
24 So I appreciate all the discussion. And
25 I think we're going to have a lot more discussion.

1 And I don't know in the end what this
2 thing's going to ultimately going to look like when
3 it's thoroughly vetted out. It may have one
4 resemblance to today, but we do need to start forward.
5 And I think to move forward to the next step we have
6 to start trying to test it.
7 I think that we're at a point where we can
8 publish this in the sense of now trying to test it and
9 improving and seeing what works, what doesn't work,
10 where do we need to add things and delete, whatever.
11 So I welcome and really appreciate the
12 ACRS' support in that area.
13 Also, I really want to recognize that
14 we've had a tremendous team on this program. You see
15 some of the members up here, but there's been a lot
16 more besides just John from Brookhaven and Tom and
17 Marty. I certainly want to recognize some of the ones
18 that are here. Bruce from ISL, Vinod from Brookhaven.
19 Dennis Bley is not here. Ben's recently joined us. I
20 think we were scaring him off.
21 MEMBER APOSTOLAKIS: The staff? He
22 joined the staff?
23 MS. DROUIN: He's been with the staff, but
24 he's joined. This past six months he's been trying to
25 come up to speed on the framework document.

1 Stu Ruben has been an integral part of
2 helping this. And other various people. So I
3 apologize if I've forgotten somebody's name. So we
4 really appreciate the support.
5 But I'm going to let John say the closing
6 remarks.
7 MR. MONNINGER: Actually, I believe Mary
8 summed it up very well along with the Committee
9 members.
10 I mean in terms of timing we are
11 interested in as much and as early feedback from the
12 ACRS as possible. I mean, it only benefits us in our
13 decision making. You know, recommendations to the
14 Commissions in May. And I think if the ACRS letter on
15 something like the framework was to come later than
16 sooner, you know, it makes it extremely difficult to
17 consider those comments.
18 I mean there's been issues in the past
19 where the staff has flowed up positions in a
20 Commission paper and within a very short time frame at
21 the same time the ACRS has. And one has to go before
22 the other so they can be appropriately balanced out.
23 But we definitely appreciate your insightful views on
24 the needed future of this project. And we'll
25 definitely take that back and discuss it and look

1 forward to many future interactions.

2 So, thank you.

3 CHAIRMAN KRESS: Thank you very much.

4 Well, I'm going to check 30 years from now

5 to see where you are.

6 Okay. I'm about to do this. Okay. We are

7 adjourned.

8 (Whereupon, at 4:21 p.m. the Committee was

9 adjourned.)

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CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: Advisory Committee on Reactor Safeguards Future Plant Designs

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.

Charles Morrison
Official Reporter
Neal R. Gross & Co., Inc.

Framework for Future Plant Licensing

Presented to Advisory Committee on Reactor Safeguards

Future Plant Designs Sub-Committee

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March 7, 2007

1

Purpose of Today's Briefing

- Technical exchange with ACRS on the technical issues addressed in the "Framework for Future Plant Licensing"
  - Referred to as the "Technology-Neutral Framework"

2

Outline

- Introductory remarks
  - History
  - Status
  - Stakeholder comments
  - Next steps
- Framework overview
- Round table discussion

3

History

- January 2003: RES Advanced Reactor Research Plan recognized the need for a licensing framework for advanced reactors
- Current regulatory structure
  - Focused on LWRs with limited application to non-LWRs
    - Advanced reactors will have design and operational issues different from LWRs
    - Contain specific requirements not applicable to advanced reactor designs
  - Evolved with limited insights from PRAs and severe accident research
    - PRA and PRA insights will be an integral part of licensing advanced reactors
- Program initiated to develop a risk-informed, performance-based regulatory structure that could be technology-neutral to support future licensing

4

Status

- Initial work (development of the "Framework") complete
  - Documented in NUREG-1860, to be published
- Framework provides guidance and criteria for creating a "risk-derived" and performance-based regulatory structure that can be implemented on either a technology-neutral or a technology-specific basis
- Framework integrates Commission's expectations as addressed in various policy statements
  - Severe Accident, Advanced Reactors, PRA, Safety Goals

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Stakeholder Comments

- Framework attached to ANPR (May 2006) requesting public review and comment
- Public workshops held March 2005 and September 2006
- Stakeholder comments received from:
  - AREVA
  - ASME (two sets)
  - Strategic Teaming and Resource Sharing (STARS)
  - Nuclear Energy Institute (two sets)
  - American Nuclear Society (two sets)
  - Pebble Bed Modular Reactor (Pty) Ltd.
  - Westinghouse
  - IEEE Power Engineering Society
  - GE Energy Nuclear
  - Nuclear Equipment Quorum
- High level comments with regard to rulemaking
  - Overall views
  - Technology-neutral versus technology-specific
  - How to proceed forward

6

Stakeholder Comments

Risk-Informed and Performance-Based "Part 53"

- Example comments
  - "should move forward with developing a risk-informed and performance based..."
  - "supports the NRC's efforts to improve ... its regulations by establishing ... a comprehensive set of risk-informed and performance-based..."
  - "support a regulatory framework that would establish a comprehensive set of risk-informed and performance-based..."
  - "departs too far from the approximately 3000 reactor years experience gained using the deterministic approach ... the significant area of departure ... in addressing common cause failure..."

7

Stakeholder Comments

Technology-Neutral vs Technology-Specific

- Mixture of views
  - Some supported technology-neutral regulations with technology-specific implementing guidance
  - Some supported technology-specific regulations
  - Some indicated too premature to decide

8

Stakeholder Comments

How to proceed forward with regard to rulemaking

- Gain experience first with design certification of a non-LWR using Framework approach
- Use a multi-year phased approach to rulemaking
- Use a Step approach
  - Develop a preliminary draft rule
  - Upon receipt of non-LWR application, publish the draft rule for information
  - Review and approve non-LWR design using Part 50/52
  - Evaluate draft rule against non-LWR design
  - Publish draft rule for comment

9

Next Steps

- Framework, NUREG-1860, to be published early summer 2007
- Staff preparing SECY paper to respond to Commission direction to "provide its [staff] recommendation on whether and, if so, how to proceed with rulemaking"
  - All activities related to Framework to be terminated
  - Evaluating the need to defer rulemaking until experience is gained with NGNP and GNEP
- Staff will brief ACRS at May full-committee meeting

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Framework Overview

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What is this Framework?

- It is a "NUREG" – a technical report that provides a structured and systematic approach in the form of guidelines and criteria for developing new requirements

⇒ ***The "Framework" is a set of technical guidelines and criteria***

- The Framework itself is not regulations

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The Framework

- Could serve as the technical basis for rulemaking (e.g., "Part 53"), exemptions or additions to Part 50
- Uses a "risk-derived" approach
- Can be applied or implemented (i.e., development of requirements) on either a technology-neutral basis or a technology-specific basis

13

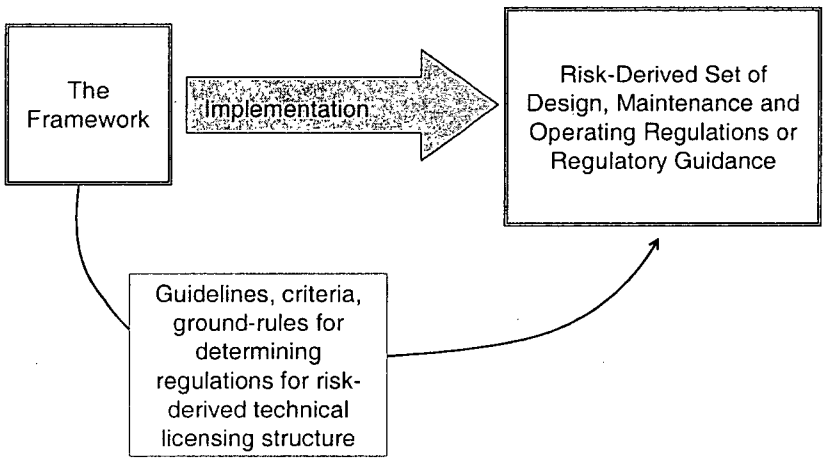
Risk-Derived versus Risk-Informed

- Risk-derived approach starts with PRA results and integrates deterministic and defense-in-depth criteria (to compensate for uncertainties) as an integral part in development of the requirement

- Risk-informed approach uses deterministic criteria to develop the requirements and then supplements with risk insights

14

The Framework



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Example Application of Framework

Example Regulations	Source	Tech-N/S
• **Aging Management Program:** Each applicant to construct and operate a NPP under this Part shall develop, implement and maintain an aging management program to detect and control aging of safety significant SSCs so as to maintain the plant within the assumptions used in the licensing analysis. A description of the aging management program shall be submitted to the NRC for review.	FW	TN
• **Requirements for monitoring the effectiveness of maintenance at nuclear power plants:** 10 CFR §50.65 language plus A maintenance program shall be developed, implemented and maintained to ensure that the reliability, availability and performance of safety significant SSCs remain consistent with assumptions in the licensing analysis. The SSC reliability, availability and performance shall be monitored and fed back into the licensing analysis.	Part 50 + FW	TN
• **Energetic Reaction Control:** Reactor designs that have the potential for energetic reactions between the fuel, coolant or other material shall include provisions to prevent or mitigate the effects of such reactions.	FW	TN/TS

16

Example Application of Framework

Example Regulations	Source	Tech-N/S
• **PRA Scope and Technical Acceptability**: each application to construct and operate a NPP shall include a design specific probabilistic risk-assessment (PRA) that (a) analyzes the risk from full power and low power operation, shutdown, refueling, and spent fuel storage (except dry cask storage); (b) includes assessment of internal and external events and quantifies uncertainties; (c) includes assessment of all event sequences down to 10-8/yr; and (d) is conducted in accordance with accepted standards appropriate for the reactor technology.	FW	TN
• **Living PRA:** Each licensee to operate a NPP shall maintain its licensing analysis up to date. The plant specific PRA shall be updated to reflect actual operating experience at least once every xx years, or sooner if major unanalyzed situations are discovered. The information from the updated PRA shall be used to update the plant's licensing basis including: LBE selection and analysis, safety classification of SSCs, procedures, NDE, ISI, and IST programs, plant aging program, emergency preparedness. Major changes resulting from these updates will require NRC approval.	FW	TN

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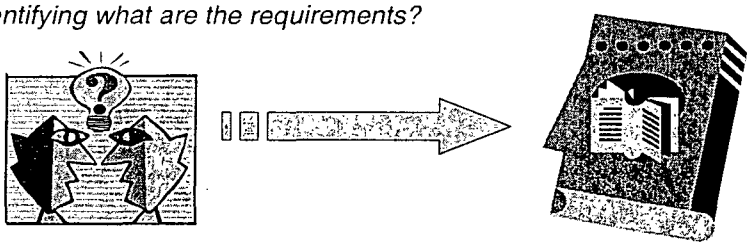
How do we get there?

How do we take this idea for a risk-derived, performance-based set of regulations they may apply to any reactor technology and actually start identifying what are the requirements?



- Need a "process"
- Process should define a goal and the guidelines and criteria for achieving the goal
- Process should address completeness

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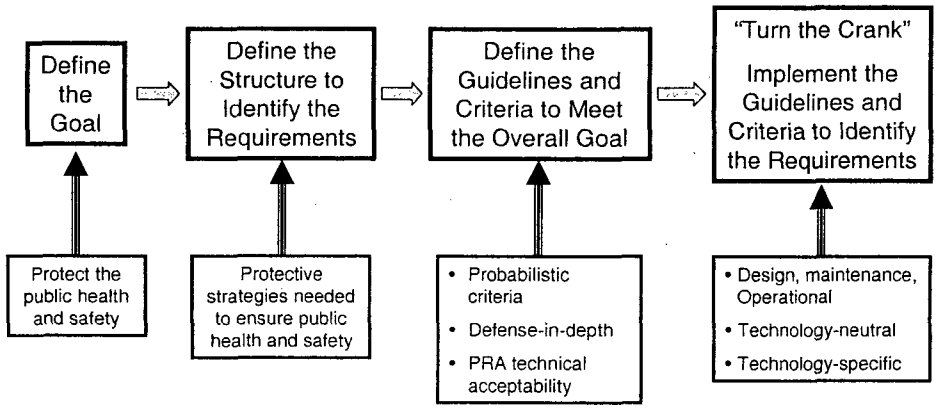
Framework Process



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Guidelines/Criteria Contained in Framework

- Risk-derived/probabilistic approach
  - Level of safety and integrated risk
  - Frequency-consequence curve
  - Licensing basis event identification and selection
  - Safety Classification
- Defense-in-depth
  - Definition
  - Principles
  - Implementation
  - Safety margins

20

Guidelines/Criteria Contained in Framework (cont'd)

- PRA Technical Acceptability
  - Scope and level of detail
  - Design stage vs operational stage
  - Living
- Identification of Design, Maintenance and Operation Requirements
  - Scope and depth of requirement similar to current GDCs
  - Keep applicable Part 50 regulations

21

"Round Table Discussion"

For each topic:

Key issues

ACRS views

Stakeholders views

22

Probabilistic approach: Frequency- consequence curve

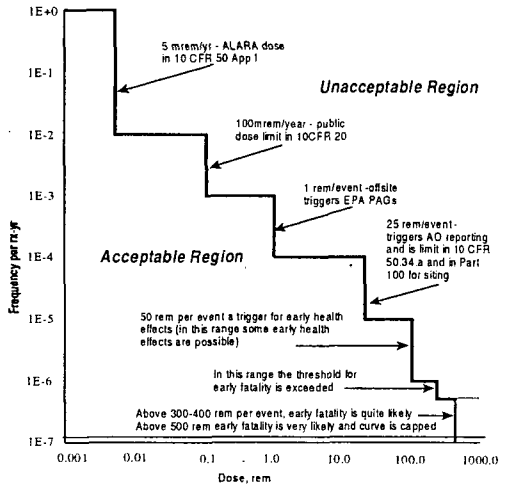


Figure 6-3 Frequency -consequence curve

Stakeholder comments:

- Different anchor points
- Add a CCDF curve

23

Probabilistic approach: LBE (Licensing Basis Event) Selection

- Identification and selection based on PRA sequences
  - Similar accident sequences are grouped into 'event classes'
  - LBE represents the event class scenario and is assigned the 'bounding' frequency and consequences of that class - has to meet f-c curve
  - LBEs have to meet additional deterministic criteria depending on frequency range they fall in: frequent, infrequent, or rare
- Stakeholder comments generally supportive of approach
  - Some differences in the detail; e.g., different "cut-off" values defining the event categories

24

Probabilistic approach: SSC selection / special treatment

- Only two categories of SSCs
  - Safety significant
  - Non-safety significant
- Safety significant SSCs are all those whose functionality is credited in meeting the LBE acceptance criteria
- Special treatment varies depending on the function and importance of the SSC

25

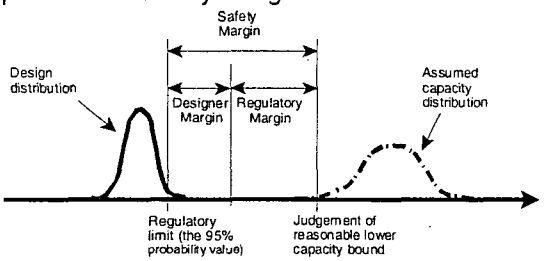
Defense-in-depth

- *Definition:* An element of NRC's safety philosophy that is used to address uncertainty by employing successive measures including safety margins to prevent and mitigate damage if a malfunction, accident or naturally caused event occurs at a nuclear facility.
- Six principles of defense-in-depth are presented in framework, related to:
  - Intentional as well as inadvertent events
  - Prevention and mitigation capability
  - Diversity for key safety functions
  - Uncertainty in SSCs and human performance
  - Containment functional capability
  - Plant siting
- Stakeholder comments:
  - Defense-in-depth should be a separate policy statement
  - Additional clarity is needed

26

Defense-in-depth (continued)

- *Defense-in-depth implementation*
  - *Use of Protective strategies*
  - *Application of Defense-in-depth principles*
  - *Incorporation of Safety margins*



- Stakeholder comments
  - ASME approach to defining safety margin generally uses the mean while the Framework uses the 95%

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PRA Requirements

Technical Acceptability	High level requirements provided. Increased requirements are included for completeness, defensibility and transparency
Scope	Encompasses the whole spectrum of off-normal events including sequences that address conditions less than the core damage sequences of the current reactors and those similar to current reactor core damage sequences
Quality Assurance	More rigorous requirements than those that are typical for current PRAs. Recommended requirements are similar to Appendix B.
Independent Peer Review	Performed by qualified personnel using an established process similar to current peer review requirements.

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PRA Stages

- Design Stage
  - Integrated with design process and expected to evolve as the design evolves
  - Supports
    - Evaluation of QHOs
    - Identification and characterization of LBEs
    - Identification and characterization of special treatment SSCs
- Construction Stage
  - Supports risk-informing the construction inspection program
- Startup (Pre-operational) Stage
  - Supports risk-informing initial staffing, training and other programs (technical specifications, testing, maintenance, procedures, etc.)
- Operational Stage (Living PRA)
  - Supports the assessment and management of operational risk and of plant changes

29

Living PRA

Input Monitoring	Process similar to the monitoring of the performance and condition of SSCs against licensee-established goals of 10 CFR 50.65. PRA related SSCs are monitored and compared with the framework's reliability and availability goals to verify that the goals are being met.
Planned Plant Changes	Process similar to 10 CFR 50.59. Plant changes are assessed using the PRA prior to implementation.
Unplanned Changes	Can result in changes to the frequency or consequence of identified LBEs, in the identification of new LBEs or in changes to safety significant SSCs. Changes that reduce margin but do not impact the framework's design criteria will not require reassessment.
Update Frequency	Primarily dependent on the scope and nature of pending changes. A maximum update interval of 5 years is proposed.

30

PRA Stakeholder Comments

- Full-scope PRA not necessary for such areas as seismic, anticipated operational events
- Determination of PRA quality does not need to be based on an 10 CFR Part 50 Appendix B approach for Quality Assurance

31

Requirements Development

- **Process Described in Chapter 8 (Figure 8-1)**
  - For each protective strategy, a logic diagram is used to identify what could go wrong to cause the strategy to not be met.
  - Requirements are intended to address the items that could go wrong.
  - DID principles applied to each protective strategy to identify where additional requirements are necessary to address uncertainties.
- **Example Requirements are Contained in Appendix J**
  - Technology neutral
  - Level of detail similar to GDCs
- **Completeness Check**
  - IAEA, NEI02-02, 10 CFR 50
- **Stakeholder Comments**
  - General agreement process seems reasonable.

32

Level of safety / Integrated risk

- Regulations for new reactors should achieve the safety goal level of safety
- Safety goals should apply to the collective risk from the entire fleet of new reactors on a site
- Stakeholder comments:
  - General agreement with staff recommendation on both issues

33

Summary

- Framework, NUREG-1860,to be published in early summer 2007
- Stakeholder comments will be summarized into five categories in an appendix
  - Comment is more of an observation and no change to the Framework is needed.
  - Comment is associated with implementation of the Framework. The issue(s) raised will be addressed dependent on if, how, and when the Framework is implemented.
  - Comment is significant enough that the framework needs to be revised before it is released.
  - Comment is more of a clarification and does not change the technical basis in the framework; will be addressed dependent on if, how, and when the Framework is implemented.
  - The staff disagrees with the comment and no change is made to the Framework.

34