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UNITED STATES NUCLEAR REGULATORY COMMISSION'S
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

December 3, 2004

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

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

518th MEETING

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FRIDAY,

DECEMBER 3, 2004

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

MEMBERS PRESENT:

- MARIO V. BONACA Chairman
- GRAHAM B. WALLIS Vice-Chairman
- GEORGE E. APOSTOLAKIS ACRS
- RICHARD S. DENNING ACRS Member
- F. PETER FORD ACRS Member
- THOMAS S. KRESS ACRS
- DANA A. POWERS ACRS Member
- VICTOR H. RANSOM ACRS Member
- STEPHEN L. ROSEN ACRS Member-at-Large
- WILLIAM J. SHACK ACRS
- JOHN D. SIEBER ACRS

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1 ACRS STAFF PRESENT:

2 SAM DURAISWAMY Technical Assistant, ACRS/ACNW,
3 Designated Federal Official

4

5

6 ALSO PRESENT:

7 CHARLES ADER RES/DRAA

8 C.E. CARPENTER OCM

9 MARY DROUIN RES/PRAB

10 CLINTON FERRELL NEI

11 TOM KING RES

12 DAVID LEW RES/PRAA/PRAB

13 STEPHEN MAZURKIEWICZ AREVA

14 SCOTT NEWBURY ISL

15 GARETH PARRY NRR/DSSA

16 STUART RUBIN RES/DSARE

17 MARTY STUTZKE NRR/DSSA/SPSB

18 M. TSMILTZ NRR/DSSA

19 JERRY WILSON NRR/DRIP

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I-N-D-E-X

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

8:31 a.m.

CHAIRMAN BONACA: Good morning. The meeting will now come to order. This is the second day of the 518th meeting of the Advisory Committee on Reactor Safeguards.

During today's meeting the Committee will consider the following. Draft Commission Page on Technology Neutral Framework for Future Plant Licensing, Policy issues.

Subcommittee Report on Draft NUREG Documents and Technical Uncertainties. Subcommittee Report on the Interim Review of the Arkansas 2 License Renewal Application.

Election of ACRS Officers for CY 2005. Future ACRS Activities and Report to the Planning and Procedure Subcommittee. Reconciliation of ACRS Comments and Recommendations, and preparation of ACRS reports.

The meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Mr. Sam Duraiswamy is the designated federal official for the initial portion of the meeting.

We have received no written comments or

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1 requests for time to make oral statements from members
2 of the public regarding today's sessions. A
3 transcript of a portion of the meeting is being kept,
4 and it is requested that the speakers use one of the
5 microphones, identify themselves and speak with
6 sufficient clarity and volume so that they can be read
7 and be heard.

8 The first item on the agenda was peer
9 review comments on the technical basis for the PTS
10 screening criteria. We already covered that
11 yesterday, so we're not going to have to go through
12 that.

13 The first half an hour of this meeting
14 will be off the record, and we will use this half an
15 hour to discuss the other letter that we were
16 considering yesterday, which is the illicitation
17 process.

18 (Whereupon, the foregoing matter
19 went off the record at 8:33
20 a.m., and went back on the record at 9:05 a.m.)

21 CHAIRMAN BONACA: I shouldn't do anything
22 to this letter then?

23 MR. KRESS: Well, you know, we've been
24 briefed on this several times in the spirit of keeping
25 us up-to-date as they go along and exchanging views

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1 and their thinking. And this is another one of these
2 status briefings, which we're all awfully glad to
3 have.

4 A letter is not intended at this time.
5 There's no good reason for it. And I repeat what I
6 said at one of the earlier briefings, that I think
7 this is one of the more exciting and important things
8 that we're doing.

9 And I hope the rest of the Committee
10 shares that view, and I have a great admiration for
11 what they've come up with so far. And I think they're
12 on the right track, and it's real historic, good
13 stuff.

14 And I want to pass that view along to you
15 guys. I think you're doing a great job. So, once
16 again, this is a status report, and I think what we're
17 going to discuss is the policy issues? Is that mostly
18 it, or --

19 MS. DROUIN: We were going to walk through
20 the SECY Paper.

21 MR. KRESS: Through the SECY Paper, okay.
22 With that, I'll turn it over to Mary.

23 MR. APOSTOLAKIS: This is the SECY Paper
24 we've seen?

25 MS. DROUIN: Yes. Thank you, Dr. Kress,

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1 for the kind words. I greatly appreciate it. My name
2 is Mary Drouin with the Office of Research.

3 Also at the table with me is Tom King and
4 Stuart Rubin. But I do want to acknowledge that
5 there's many other players in this process, in the
6 three that you've seen here, and they've all made a
7 tremendous contribution to this work that we're doing.

8 Today's purpose, we're here, you were
9 given a draft copy of the SECY Paper. It's in
10 concurrence right now. It has received Division Level
11 concurrence, so even though it's drafted, it is
12 progressing through the concurrence chain.

13 And we wanted to give you a status because
14 what's in the SECY Paper is essentially a status of
15 the program. There's three main things in the SECY
16 Paper, it's our effort, where we are with regard to
17 the frame work.

18 It goes through the policy issues and how
19 they're addressed in the frame work, and there's nine
20 policy issues at this point that we've identified.
21 And then our proposed schedule for completion, for the
22 overall program, not just for the frame work itself.

23 So if I get to this overall program, the
24 regulatory structure for, what we call the regulatory
25 structure for new plant licensing, there is four parts

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1 to it.

2 The technology neutral frame work, and
3 then a set of proposed technology neutral
4 requirements. A technology-specific frame work, which
5 is showing how we plan to apply the technology neutral
6 and technology-specific basis.

7 And data application then would be the
8 derivation of technology-specific regulatory guides.
9 So far the work is concentrated on the technology
10 neutral frame work, which is what we're going to go
11 through on the first part of today's presentation.

12 MR. KRESS: On the technology-specific
13 regulatory guidance, do you envision a regulatory
14 guide for every application that comes in for
15 certification for, you know, each plant is slightly
16 different.

17 Like in MHTGR, would that be of a
18 different reg guide than a title bed modular reactor,
19 do you think? I mean you would have special reg
20 guides for every reactor.

21 MS. DROUIN: Not every reactor.

22 MR. KRESS: Because you're going to group
23 them as types?

24 MS. DROUIN: Yes.

25 MR. KING: Yes, HTGR reg guide, sodium

1 reactor reg guide, that kind of thing.

2 MR. KRESS: Well, do you salt the reactor?

3 MR. KING: In theory.

4 (Laughter.)

5 MR. DENNING: One can only hope.

6 MS. DROUIN: Okay, moving to the frame
7 work.

8 CHAIRMAN BONACA: Mary, you are blocking a
9 little bit the screen. Can you move to your right?
10 Thank you.

11 MS. DROUIN: Sorry, I just feel so
12 separated. I want to emphasize on the third bullet
13 because I think that's very important. This is a
14 working draft so far.

15 This is very preliminary. Everything
16 that's in the frame work is not finalized. These are
17 points to start dialogue and discussion with the
18 community at large, not just in our C staff members,
19 but our various stakeholders.

20 But we do feel that we've done enough work
21 that it's feasible to develop this technology neutral
22 frame work. There are technical issues to be
23 resolved, there are policy issues to be resolved.

24 But we do think we've done enough that
25 it's feasible at this point. We have had some public

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1 meetings. We had a small public workshop on this.

2 MR. KRESS: Who came to those, Mary? Who's
3 involved in this discussion? Are you guys connected
4 with the IAEA? You know their working on a similar
5 sort of thing.

6 MS. DROUIN: Yes, we are, because I've been
7 sitting on that group.

8 MR. KRESS: You're part of that group?

9 MS. DROUIN: I'm part of that group.

10 MR. KRESS: Okay.

11 MS. DROUIN: So the answer is yes.

12 MR. KRESS: And they moving down pretty
13 much the same direction you guys are?

14 MS. DROUIN: So far we've been consistent.
15 We aren't absolutely identical, but we're consistent.

16 CHAIRMAN BONACA: They seem to emphasize
17 the IAEA concept of defense in depth, six, seven
18 letters of defense in depth. They start out with a
19 strong statement about defense in depth. Is that
20 consistent with what you guys are doing?

21 MS. DROUIN: Well, I think it's consistent
22 in the sense that we start off with the protective
23 strategies which we always say is defense and depth.

24 Where we differ is that they tend to put
25 more in defense and depth in the sense where I think

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1 they, everything they call defense and depth.

2 MR. APOSTOLAKIS: The other impression I
3 got when I read one of their drafts, I don't know what
4 is at stake now, is that they still believe that
5 fundamentally the system should be deterministic.

6 The traditional system and PRA will help
7 do sensitivity studies and support various decisions.
8 Is that your impression as well?

9 MS. DROUIN: At the very beginning, that
10 was our impression. It was very much so. But we've
11 been working very hard to try and turn that around.
12 And I think we've made a lot of headway with them
13 becoming more risk-informed.

14 MR. APOSTOLAKIS: Okay.

15 MS. DROUIN: But that is because, you know,
16 what's being developed by IAEA, very many different
17 member countries and some member countries you just
18 absolutely, this has got to be 100 percent
19 deterministic.

20 But I do think that has become more risk-
21 informed.

22 MR. KRESS: My original question started
23 out as who --

24 MS. DROUIN: And I'm going to --

25 MR. KING: Yeah, I wanted to say I think

1 it's an important question. We've had two major
2 workshops and we both, both of those have had like 25
3 or 30 non-NRC people.

4 And it's, you know, it's NEI, it's EPRI,
5 it's a number of the vendors. DOE, Jim Ricchio has
6 attended from Green Peace. National Lab, some of the
7 Lab people have been there.

8 MS. DROUIN: Westinghouse has been there,
9 Framatome

10 MR. KING: AREVA.

11 MS. DROUIN: AREVA.

12 MR. KRESS: What is their general
13 impression so far? They think this is a good thing
14 and going in the right direction? Or is it too early
15 for that?

16 MS. DROUIN: I think, you know, as we've
17 shown on the second bullet there, there's a general
18 agreement for the need, and for the conceptual bases.

19 But I think when we get into the details,
20 you know, I think there's agreement in some places and
21 disagreement. I think they're very anxious to see
22 this document which they haven't seen yet.

23 So we can start getting into discussions
24 on these details.

25 MR. KING: We've gotten letters from NEI

1 and Framatome and somebody else I can't remember that
2 you might be interested in seeing, that give, you
3 know, their overall support as well as their detailed
4 comments.

5 MR. APOSTOLAKIS: Has NEI had a report,
6 maybe a year or two ago, addressing the issue of
7 technology neutral frame work? Are they still working
8 on this? That was based on defense and depth ideas,
9 again.

10 MS. DROUIN: Well, I don't want to speak
11 for NEI, but I haven't --

12 MR. APOSTOLAKIS: But what do you know
13 about it?

14 MS. DROUIN: My indication is that there
15 has been no update to that report.

16 MR. APOSTOLAKIS: So they are not working
17 on it anymore, as far as you know?

18 MS. DROUIN: In terms of revising that
19 report that, not to my knowledge. I don't know if, I
20 know there's a representative from NEI, if they want
21 to say something to it.

22 MR. APOSTOLAKIS: Do you?

23 MR. FERRELL: Yes, I'm Clifton Ferrell with
24 NEI. We have an active task force right now that is
25 updating NEI-0202 and we are going to be using those

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1 refined comments as we work with Mary in developing
2 the frame work, yes.

3 MR. APOSTOLAKIS: Okay, good.

4 MS. DROUIN: Good. I didn't realize that.

5 MR. APOSTOLAKIS: That was news to you?

6 MS. DROUIN: That was news to me, but good
7 news.

8 CHAIRMAN BONACA: Did you choose the Ides
9 of March for some sort of purpose?

10 MS. DROUIN: Yes, actually we picked those
11 dates very deliberately because the week before is the
12 RIC Conference, so we were trying to piggyback since
13 a lot of the same people --

14 MR. KRESS: Do you think it would be
15 worthwhile for one of us to be there?

16 MS. DROUIN: Yes, and you'll see that on a
17 viewgraph that we would encourage members of ACRS to
18 come to the workshop. I'm sorry?

19 CHAIRMAN BONACA: Did you say the Greek
20 conference?

21 MS. DROUIN: I'm sorry, the Regulatory
22 Information Conference.

23 MR. KING: Which is the eighth through the
24 tenth of March.

25 CHAIRMAN BONACA: I'm sorry.

1 MR. KING: They'll be a lot of people
2 there, we hope they hang around and come to this.

3 MS. DROUIN: Okay. Now we're not going to
4 try and get into any details, technical details on
5 today's presentation. There's just a lack of time and
6 there's a lot.

7 We're just trying to give you a status of
8 where we are on everything as we noted in the SECY
9 Paper. As I said on, with regard to the frame work,
10 I feel we've done enough to show that it's feasible to
11 develop this technology neutral.

12 It is a hierarchical structure where we
13 blend both deterministic and probabilistic criteria
14 and the criteria and guidelines that are in the frame
15 work. Those are criteria and guidelines that we would
16 use, the staff would use to develop the set of
17 technology neutral requirements.

18 And so there are six parts to the frame
19 work document. The first one sets the overall safety
20 philosophy from, which we're operating under. And
21 then it gets directly to the protective strategies.

22 The protective strategies are defining
23 those strategies that, if they're fulfilled, then it
24 accomplishes the safety philosophy. And so we are
25 going to be writing the requirements or deriving the

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1 requirements to meet the protective strategies.

2 We've established risk objectives to help
3 in the decisions. We also have design construction
4 and operational objectives.

5 Let me go back for a second to the risk
6 objectives. That's getting into, you know, we've
7 outlined a frequency consequent curve.

8 We are looking at using some lower level
9 subsidiary objectives, and those have a lot of issues
10 associated with them, particularly when you're trying
11 to do it at a technology neutral level.

12 MR. KRESS: Yeah, that's the one place
13 where I felt like you were going to be beating your
14 head against the wall, and not getting very far.
15 Subsidiary objectives, surrogate is more --

16 MS. DROUIN: Right, surrogate.

17 MR. KRESS: -- for FC curves, in my view,
18 are basically impossible.

19 MS. DROUIN: No, we're looking to a good
20 discussion at this workshop. Safety classifications,
21 using these risk objectives to help us define our
22 design.

23 MR. KRESS: I'd like you to put that on the
24 workshop list, is it possible to get surrogates for an
25 FC curve --

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1 MS. DROUIN: Absolutely.

2 MR. KRESS: - in terms of some things like
3 CDF.

4 MS. DROUIN: One of the things that we're
5 doing is we're going to be sending out a Federal
6 Register Notice, of course, advertising the workshop.
7 But in the Federal Register Notice is we have
8 identified a whole list of very specific issues that
9 we would like to really get into at the workshop.

10 MR. KRESS: You know, I think you guys are
11 facing up to some of the toughest issues that we have
12 that, in my mind, have been part of the reason for a
13 lot of the incoherence in the current regulatory
14 system.

15 And, you know, I really applaud your
16 fortitude and your guts. You're really facing up to
17 some tough issues, and you know, I'm proud of you, I
18 really am.

19 MS. DROUIN: Thank you. Laying out design
20 construction and operation objectives. Treatment of
21 uncertainties which gives into defense and depth. And
22 I'll get more into that on another slide. Yes.

23 MR. POWERS: If you lay out the design
24 construction and operational objectives you don't go
25 through the full lifecycle here. why not?

1 MS. DROUIN: Go ahead.

2 MR. KING: No, I think we do try to go
3 through the full lifecycle. I'm not sure what you
4 have in mind when you say we don't. I mean
5 construction we're thinking, yeah, we only construct
6 it once, but we do talk about maintenance and
7 surveillance and ISI and that kind of thing.

8 MR. POWERS: And then, but you leave off
9 the decommissioning and removal part of it.

10 MR. KING: We have left off
11 decommissioning, that's one of the comments we've
12 gotten from outsiders is maybe we ought to think about
13 adding decommissioning, but we haven't done it yet.

14 MR. POWERS: See, that's a full lifecycle,
15 so you're -

16 MR. KING: .In that sense you're right,
17 you're right.

18 MR. POWERS: Well, that is the full
19 lifecycle, right?

20 MR. KING: Yes, it is, yes.

21 MR. POWERS: And the reason I bring it up,
22 you may do it more by reference than anything else, is
23 that the decommissioning characteristics of some of
24 the advanced reactors may be troublesome.

25 And I call attention just to the

1 challenges that you're having with a relatively
2 limited level of contamination on some graphite, from
3 graphite reactors.

4 And, I mean, it's a situation of where
5 you've got a huge volume and not a great deal of
6 contamination, but enough so that you can't go to a
7 low level, disposal field, but it's so big that, I
8 mean, it would occupy all of Yucca Mountain. One
9 solar reactor core that was a test reactor.

10 It's that kind of a problem. And, I don't
11 know what you do with it except maybe, maybe if it is
12 activity you just say, and this has to be, set up a
13 group to go work this issue because it's going to be
14 a problem.

15 MS. DROUIN: Okay.

16 MR. POWERS: And when you discuss this, I'm
17 certain you're going to give us a little more on that.

18 MS. DROUIN: I'm sorry?

19 MR. POWERS: Can you tell us more about the
20 uncertainties that you discussed?

21 MS. DROUIN: Yes, I have a slide on that
22 I'm going to get to. The last part in the frame work
23 document is what we call the process for defining the
24 scope of requirements.

25 And that is telling you how we take these

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1 five things above it, bring it together and use it to
2 actually develop the set of requirements.

3 On each of these, there's policy and
4 technical issues associated with each of them. So far
5 there are nine that we have addressed. I'm sure as we
6 get more into finalizing the frame work document, and
7 having discussions with the various stakeholders, I'm
8 sure there will be more issues that will come up, than
9 just these nine that we have identified to date.

10 What are these nine? And we're going to
11 go through each one of these, but our definition of
12 defense and depth, which is the treatment of
13 uncertainties. Use of the probabilistic approach to
14 establish the licensing basis.

15 Scenario of specific source terms.
16 Revision of the EPZ. The integrated risk, which we've
17 been here and spoken with the committee on a couple of
18 times. The same thing with the next one, the
19 containment functional performance requirements.

20 Level of safety, physical protection and
21 selective implementation. And we're going to go
22 through each.

23 MR. KRESS: You can see from our previous
24 letter that even the ACRS is split on this question of
25 integrated risk.

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1 MS. DROUIN: Yes.

2 MR. KRESS: We still, I think we still are
3 split.

4 MS. DROUIN: Oh, so you're not going to
5 give us a little surprise today that you've resolved
6 that?

7 (Laughter.)

8 MR. KRESS: No, we haven't come together.

9 MR. APOSTOLAKIS: I'm sorry, I didn't hear.
10 What is -

11 MR. KRESS: That's the only thing we argued
12 is whether you need a CDF for a site or CDF for a
13 plant-

14 MR. APOSTOLAKIS: Oh, yes.

15 MR. SCHACK: Divide by the number of
16 reactors in the country.

17 MR. APOSTOLAKIS: Some members think, some
18 other members don't, and the Commission is -

19 MR. POWERS: Are you claiming that we have
20 blue and red ACRS members?

21 (Laughter.)

22 MR. KRESS: Absolutely. And some are
23 purple.

24 MS. DROUIN: Okay, treatment of
25 uncertainties, defense and depth. If you go back to

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1 SECY 030047, I think I have the right year. There
2 were seven policy issues that were noted in that SECY
3 paper. An SIM came back and out of four of those
4 issues, they approved what the staff had recommended.

5 Two others, which was integrated risk and
6 containment, they asked us to do more work. One of
7 them they did not agree, and that was on International
8 Codes and Standards, which we're not getting into
9 today's presentation, because it's not part of the
10 frame work.

11 But on the five, no, sorry, six that were
12 in there, that SECY paper did say that these would be
13 incorporated through the development of the frame
14 work. So now we're moving over into that arena.

15 But going back there, what we had
16 recommended and the Commission approved, with regards
17 to defense and depth, was our recommendation to
18 develop a description that would be ultimately
19 incorporated into a policy statement, but come up with
20 a working definition.

21 So what we, the approach we've taken in
22 the frame work was that we have four main elements to
23 it. And then, a lot of this is not new. You know, we
24 went to the Commission's White Paper and SECY papers
25 on defense and depth.

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1 We looked at what the ACRS had to say and
2 everyone in private, and consolidate that all
3 together. So the first was coming up with our
4 objectives, and then we defined the principles and we
5 developed a model where we tried to incorporate in
6 this model, both a probabilistic and deterministic
7 aspects are using, you know, the ACRS words
8 incorporated in both the structuralist and a
9 rationalist part to it.

10 And then develop a process for
11 implementation. We do plan to come up with a proposed
12 revision to the Commission's PRA policy statement to
13 incorporate a definition on defense and depth. We
14 haven't started that yet, but that is on our agenda to
15 start next year, as we develop more of this part of
16 the frame work on defense and depth.

17 MR. KRESS: Well, that would be one of the,
18 that would be a real advance, coming up with a good,
19 firm definition and a way to say this is enough
20 defense and depth or this is necessary and sufficient.

21 MR. POWERS: That's the key to it, is that
22 it's not so important to have a definition to defense
23 and depth, it's important to have a criteria that
24 allows you to know where you need defense and depth
25 and when enough has been done.

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1 MR. KRESS: Yeah, and, yeah, go ahead.

2 MR. POWERS: I mean the problem always is
3 that you can start applying defense and depth and just
4 never quit. And, because there's no in condition on
5 this.

6 And it's coming up on an in condition is
7 enormously useful. And the problem you always have is
8 analysts are always very confident in their ability to
9 calculate probabilities and bound them with
10 uncertainty ranges.

11 And then there's that person that's going
12 to continually ask, what if you're wrong?

13 MR. APOSTOLAKIS: But as long as there is
14 a need for structuralist approach, which I think will
15 be there in the foreseeable future, you can't answer
16 the question, how much is enough?

17 I mean, you have to use your judgement at
18 some point. You can only answer that if you follow
19 the rationalist approach, which is not ready for prime
20 time I don't think.

21 Take the TBS, the Transitional Break Size,
22 I mean, LOCA, people have done all sorts of studies
23 and stuff or it has taken the lead and, you know,
24 there are all sorts of limitations to what they have
25 done, and they're the first ones to admit it.

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1 So NRR now has to apply a structuralist
2 approach and say, you know, we will increase it by X.
3 Why? Well, that's our best judgement. Why not X plus
4 one or X minus one? Who knows?

5 MS. DROUIN: Well, what we have tried to do
6 is blend both the structuralist and rationalist
7 together. And our model is trying. Now whether or
8 not we'll ultimately be successful, remains to be
9 seen.

10 But the approach we're laying out is using
11 the rationalist part to put, define that end state.
12 To help you define on the structuralist side when you
13 have enough defense and depth.

14 MR. APOSTOLAKIS: Well -

15 MS. DROUIN: So we do believe that you can
16 be blending both the structuralist and the rationalist
17 and come up with a model that would address Dr.
18 Powers' concern.

19 MR. APOSTOLAKIS: My point is, yeah, this
20 is what we attempted to do in that paper, too. But we
21 called it a pragmatic approach.

22 My point is that, I mean, Dr. Kress keeps
23 asking the question, you know, can we get a criterion,
24 presumably a numerical criteria, that would tell us in
25 this case, this amount of defense and depth is

1 sufficient. And my argument is that as long as
2 there's a need for structuralist elements, you cannot
3 answer that question.

4 But it's not criticizing you. I mean,
5 this is it, this is the way we are today.

6 MS. DROUIN: No, I just don't agree with
7 you.

8 (Laughter.)

9 MR. APOSTOLAKIS: How could you do that?

10 MR. KING: Well, it seems to me the
11 structuralist piece is sort of a minimum, the floor.
12 You'll have certain structuralist pieces of defense
13 and depth, no matter what your design looks like.

14 And then beyond that, depending on the
15 design, at least the approach we've come up with, is
16 you take a rationalist approach to figure out where do
17 you stop.

18 And where you stop will be different from
19 design to design. But if you lay out the criteria
20 using, you know, risk criteria, it will tell you where
21 you stop putting in defense and depth based upon
22 certain risk criteria.

23 So then you've got the two extremes. The
24 floor, the minimum, and the maximum. And the minimum
25 will always be the same regardless of what your design

1 looks like, and the maximum will vary on the design.

2 MR. APOSTOLAKIS: No, I don't think we
3 communicate very well.

4 MR. KING: Okay.

5 MR. APOSTOLAKIS: Structuralist means
6 essentially you're answering the question that Dana
7 has raised many times. What if you're wrong? Okay,
8 you do the analysis, what if you're wrong?

9 Then you use your judgement and you say,
10 well, you found wrong, I might as do this as well, to
11 protect me. Okay? And this extra thing you do is not
12 always quantifiable. So you can't say this is
13 sufficient.

14 MR. KING: But it is based upon a judge of
15 what the uncertainties are.

16 MR. APOSTOLAKIS: Absolutely.

17 MS. DROUIN: Yeah, and that -

18 MR. APOSTOLAKIS: But you don't quantify,
19 because these are -

20 MR. KRESS: I think that's the key, though,
21 George. See, instead of asking the question, is what
22 if I'm wrong? I think they're changing the question
23 around, it's, how wrong am I likely to be? And that's
24 the uncertainty.

25 And that you can use, in a sense, to

1 decide on how much structuralist defense and depth you
2 need. And I think that's an approach.

3 MR. APOSTOLAKIS: In my mind, you would be
4 able to do that if you were able to quantify
5 uncertainties in duty and completeness. And I don't
6 see how you can do that.

7 MR. KRESS: And that's the, well, that's
8 the question.

9 MR. POWERS: I mean, it seems to me that
10 this approach of reviewing structural defense and
11 depth as kind of a baseline, I don't know that it's a
12 minimum, but it's a baseline.

13 And then using a more rational approach,
14 within that, that structure, is not a bad idea.

15 MR. APOSTOLAKIS: No, it's great.

16 MR. POWERS: And I think that, when I hear
17 the words blending I get nervous because the problem
18 is structural defense and depth is unbounded.

19 MR. APOSTOLAKIS: Yes.

20 MR. POWERS: Okay, unless you artificially
21 bound it. And what Tom is saying is, okay, he's going
22 to bound it because he's going to find a minimum here
23 and he's going to bound it that way.

24 And then he's going to apply rationalist
25 where, elsewhere in the thing, because he had the

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1 rationalist approach has a bound on it. It doesn't
2 sound like a bad idea to me, but I would not call it
3 a blending.

4 I like this more minimum and then account
5 for your uncertainty kind of rationalist approach on
6 top of it. It's a more appealing description to it
7 than a blend.

8 MR. WALLIS: It's almost as if one
9 reinforces the other, rather than -

10 MR. POWERS: Well, it's a case of, you
11 know, give Caesar what Caesar's due. They each have
12 its place and the problem is always that, the problem
13 with structural defense and depth is that if I apply
14 it at too low a level, I end up with chaos.

15 Because, you know, if one pumps good, then
16 two pump must be better. Well, two is good, gee,
17 three must be even better. And there's no end to
18 that.

19 MR. KRESS: And it's two different kinds of
20 pumps.

21 MR. APOSTOLAKIS: I just don't think you
22 can have such a clean separation. Because, I fully
23 agree that you have to have the structural, as you
24 guys define, you know, defense and depth, for example,
25 prevention versus mitigation, you say this is what I

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1 want to see. That's great. Then you go to the
2 rationalist. Unfortunately, in applying the
3 rationalist approach, you will realize very quickly,
4 in certain instances, that there are uncertainties you
5 have not quantified.

6 There may be incompleteness issues and so
7 on, so you're reverting back now to structuralist
8 mode, but that lower level. It's not rationalist all
9 the way. It can't be.

10 MR. KRESS: But, George, I maintain you've
11 got to do something about those uncertainties. You've
12 got to include them in there some way.

13 MR. APOSTOLAKIS: Well, I mean, if you guys
14 want to start quantifying uncertainties due to
15 incompleteness and models, that would be great. I
16 mean there is a first step with -

17 MR. KRESS: That's exactly, that's exactly
18 my point.

19 MR. APOSTOLAKIS: - work that we reviewed
20 at the Subcommittee meeting.

21 MR. KRESS: Yeah, but in order to do this,
22 I think you have to have some way to deal with those
23 uncertainties.

24 MR. KING: Yeah, I like to call them
25 qualitative uncertainties. Not going back to the

1 structuralist -

2 MR. APOSTOLAKIS: In my mind that's
3 structuralist. The moment say that then you start
4 putting, I mean look at the you guys maybe are not up-
5 to-date with this, but we were briefed yesterday on
6 how to choose a position of break size in the revision
7 of 5046.

8 And, you know, the staff came up with
9 their expert opinion and recitation process,
10 distribution, blah, blah, blah, then the decision
11 maker now looks at all that.

12 And says, well, gee, you know, they did a
13 good job but there are still uncertainties. We will
14 go with this size. Now, in my mind this is a
15 structuralist thinking.

16 Now why four inches greater than the upper
17 percentile of the distribution and not six? That's
18 the part you can't really quantify and say four inches
19 is sufficient, five is too much.

20 In my mind this is still up in the air and
21 I think that's -

22 CHAIRMAN BONACA: There was a practical
23 decision that said let's take the largest attached
24 pipe to the RCS. That is bringing that kind of, you
25 know, and that's, so since you don't have any further

1 base to make a judgement, I mean, what you do you just
2 anchor yourself to come kind of --

3 MR. KRESS: Yeah, but that's a cop out with
4 respect to what George is saying. Suppose you didn't
5 have that to lean on. And, George, I maintain that
6 yes it's difficult, but it's not impossible to deal
7 with these uncertainties in a sense of, you have to
8 come down on how much uncertainty am I willing to live
9 with.

10 And then you have to be able to quantify
11 in some way, these uncertainties are bounded. And
12 that's the approach that needs to be taken.

13 MR. APOSTOLAKIS: Idea, yeah, yeah.

14 MR. KRESS: But that's the only, that's
15 only practical --

16 MR. APOSTOLAKIS: This conform in service
17 inspection. How many times has Dr. Shack told us that
18 everything we do there is a defense and depth measure,
19 because from the risk perspective we shouldn't be
20 doing anything. Is that true or not?

21 MR. SCHACK: It's roughly true.

22 MR. APOSTOLAKIS: It's roughly true. Risk-
23 informed ISI is a defense and depth measure.

24 MR. KRESS: Well, that could be considered
25 part of the baseline, see. Okay, we won't deal with

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1 this in risk base, we'll just say you got to do it.

2 MR. APOSTOLAKIS: But that's my point. Why
3 do you make that decision?

4 MR. KRESS: But those things are not part
5 of the design, they're part of the, I think there's a
6 lot of operational things that you're not going to
7 include in the risk.

8 You're dealing mostly with design here.
9 And those are operational issues. I think they treat
10 them probably pretty much the same way they've been
11 treating it for years.

12 MR. APOSTOLAKIS: Anyway, the fact that
13 these issues have been acknowledged I think is a
14 healthy step forward.

15 MR. POWERS: Let's see how they resolve it.
16 And simply remember the dictate from one of your
17 heroes, Stan Kaplan. When you're having trouble
18 quantifying things, go out and quantify them.

19 (Laughter.)

20 MR. KRESS: Oh, I like that. I never heard
21 that. But you can tell we're very interested in this
22 subject.

23 MS. DROUIN: Please come to the workshop.

24 MR. KRESS: Some of us will be there, I
25 guarantee it.

1 MS. DROUIN: But I will say this. We will
2 quit using the word blended, if that's
3 mischaracterizing it.

4 MR. POWERS: No, no, I didn't mean to be
5 too critical, it's just I like Tom's description as
6 more consistent with my way of approaching it, I
7 guess.

8 MR. KRESS: Well, will we have to let you
9 know if we're coming to the workshop or do we just
10 show up?

11 MS. DROUIN: No, you just show up. Unless
12 you want to do a presentation as a member of the
13 public.

14 MR. KRESS: No, I think I just want to
15 listen.

16 MS. DROUIN: Okay, at this point I was, Tom
17 is going to walk through the next part of the
18 presentation and then Steve is going to do part, and
19 then I'll pick up the tail end.

20 MR. KING: Yeah, the next issue on the list
21 was what we call probabilistic licensing basis, where
22 the Commission approved, as a policy matter, that we
23 could use probabilistic criteria and probabilistic
24 approach for establishing a licensing basis.

25 MR. KRESS: That's a big step right there.

1 MR. KING: Now what we're working on is
2 what does that mean. And what it means is a different
3 way of doing things in several areas.

4 One, doing away with the traditional
5 single failure criteria and using the PRA event
6 sequences to establish what are the failures you need
7 to consider, both in the design and in the safety
8 analysis to allow the use of scenarios, specific
9 source terms.

10 And we have a separate slide on that, so
11 I won't say anymore on that at this point.

12 MR. KRESS: When you talk about doing away
13 with the single failure factor, what you're doing is
14 trying to be more realistic. Instead of saying that
15 some of these safety systems have a probability of one
16 of not being in operation, they're actually going to
17 give them -

18 MR. KING: Give them a probability.

19 MR. KRESS: And there's some uncertainty on
20 it.

21 MR. KING: Right, right.

22 MR. APOSTOLAKIS: Plus you're going to have
23 a problem with some of these new designs they use
24 components that are kind of new, we don't have any
25 records and we don't know what their failure rates

1 are.

2 I don't think it's as simple as it sounds,
3 and Mario, I'm surprised you're silent. Your
4 objection to 5046 choice of the TBS was that they're
5 doing away with the single failure criteria for breaks
6 above the TBS.

7 CHAIRMAN BONACA: No. No, no.

8 MR. APOSTOLAKIS: That's what you told me
9 yesterday.

10 CHAIRMAN BONACA: No, you're taking bits
11 and pieces to support your own way, and then you make
12 your own -

13 (Laughter.)

14 MR. APOSTOLAKIS: No, that's what you told
15 me.

16 MR. POWERS: And why do you find this
17 unusual?

18 (Laughter.)

19 CHAIRMAN BONACA: No, no, in fact, I mean
20 yesterday you talked and I listened to you. I said
21 no, yes, and then it goes through my,

22 MR. APOSTOLAKIS: Anyway, let's go on.

23 MR. KING: You might argue that some
24 elements of the single failure criteria concept are
25 still embedded in the defense and depth structuralist

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1 pieces of defense and depth.

2 We can deal with that in more detail
3 later. Defining event sequence categories by
4 frequency. What we've come up with is three
5 categories of events that need to be considered in the
6 design, and they are defined by frequency.

7 We call them frequent, infrequent and
8 rare. There's numbers in the frame work to define
9 those.

10 MR. POWERS: When did you find it necessary
11 to define categories? I mean why did, I mean what do
12 you use the categories for?

13 MR. KING: The reason we felt it was
14 necessary to define categories, is because we're still
15 in a risk-informed approach, we're not a risk-based
16 approach.

17 So we still feel it's important to
18 identify from these categories, things that would
19 traditionally be called anticipated operational
20 occurrences or design-basis accidents.

21 Because, for example, we're not changing
22 part 100. We need to define something that's going to
23 be used to assess against the citing criteria. And we
24 still wanted some deterministic look at things, not
25 just strictly a probabilistic look.

1 So we're using those categories to select
2 some things that would be labeled and dealt with in a
3 more traditional sense.

4 MR. DENNING: Could you help me with a
5 little bit, with the PRA that's the basis upon which
6 you're going to do all these, this is something that
7 an Applicant puts together?

8 I mean obviously there's no data on a lot
9 of these systems that they have, and so there's a lot
10 of hypothetical elements to this PRA at the design
11 stage.

12 But you're going to, he's going to fix
13 some PRA that's part of his submittal as his design
14 PRA. And the thing, one of the things that concerns
15 me is then based upon that, there will be decisions
16 made as to what follows design-basis events and what
17 are not design-basis events.

18 And then what happens as there's true
19 evolution throughout the life of the plant and you
20 start to have something where you really believe the
21 PRA represents the real system, and that dramatically
22 changes some, what happens then to design-basis
23 events? Do they no longer, do they change with time?

24 MR. KING: Yeah, what you're talking about
25 is the very last bullet on this slide. The Licencee,

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1 the Applicant is going to responsible for developing
2 the PRA and the technical basis that supports it.
3 What our frame work and our requirements will have is
4 some guidance and criteria regarding the scope and
5 depth and quality of that, what that PRA is now.

6 When he comes in at the design stage,
7 you're right, there's going to be more uncertainties
8 than later on when they get actual information. And
9 that's why we say use the term Living PRA in the last
10 bullet.

11 One of the things that goes along with the
12 concept of a living PRA, is what do you do with the
13 changes as they come in and then the PRA is updated.
14 And that's an issue we have to face in the sense that
15 it could affect safety classification.

16 It could affect design identification, the
17 design-basis accidents, anticipated operational
18 occurrences. How do you factor those back in to a
19 design that's already been approved? And we need to
20 come up with a process that does that.

21 You know, right now we have changes that
22 are made in plants and there's a process that's called
23 5059 in the regulations that allows a Licensee to make
24 changes on their own, if they fall below a certain
25 safety threshold.

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1 You know, he has to notify the NRC, but
2 they can go make the changes. But above a certain
3 safety threshold NRC approval is required. We're
4 thinking of a similar type process.

5 We haven't laid it out yet given the
6 complexities of certified designs and the fact that a
7 living PRA could affect a lot of things. But it's
8 clearly an issue we have to deal with, and we know we
9 have to deal with it.

10 MR. DENNING: Because I think stability is
11 really important here.

12 MR. KING: Yes.

13 MR. DENNING: And we're pinning things to
14 PRA, which we know is going to have a lot of movement
15 from this preliminary PRA to what really gets
16 implemented. And as we start to obtain information,
17 understand what the true risk from that plant, better
18 understand. We never understand.

19 MR. KING: We know what the issue is. The
20 industry knows what the issue is, we have to deal with
21 it in this process. We don't have an answer at this
22 point.

23 MR. APOSTOLAKIS: Now the DBAs that you're
24 referring to, do not necessarily have to have the same
25 features that the current DBAs have, do they?

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1 MR. KING: Right, and that's a key point.
2 Today's LWRs have a stylized set of DBAs that they all
3 have to design the plan for. This would be design
4 dependent.

5 MR. APOSTOLAKIS: I'm sorry, design what?

6 MR. KING: Design-dependent. You know,
7 depending on the design and what the PRA says, you
8 would select those things that you would identify as
9 DBAs based upon the criteria and the frame work.

10 And they would different from design to
11 design.

12 MR. APOSTOLAKIS: But would they, would the
13 requirements again include things like you have to do
14 your thermal hydraulic analysis using conservative
15 codes and estimates. You would have to have single
16 failure criteria here and there.

17 MR. KING: No.

18 MR. APOSTOLAKIS: What would be the
19 definition then of the DBA?

20 MR. KRESS: We're doing away with the
21 single failure criteria. If you pick an event
22 sequence and say that's my DBA because if, you know,
23 it has a high consequence for example.

24 MR. SCHACK: And you, the Applicant is the
25 person who chooses these design bases?

1 MR. KING: They propose.

2 MR. SCHACK: They propose.

3 MR. APOSTOLAKIS: There would be some
4 negotiation.

5 MR. KING: And that event sequence may
6 have, you know, one, two or three failures in it, and
7 then that's what you assume in your design and your
8 safety analysis.

9 MR. WALLIS: Well, wouldn't you need things
10 like if it's 2200 degrees, it seems to me that if the
11 PRA reflected the consequence of going to 2300, 2400,
12 2500 degrees, you wouldn't need to specify some
13 magical criteria.

14 Like 2200, if you just had it in the PRA,
15 and you make decisions based on that.

16 MR. KING: Well, in the frame work, and in
17 the technology neutral requirements we'll probably
18 have some qualitative criteria. For example, DBAs, we
19 don't want core melt accidents as part of your DBA.

20 Now what's that mean in terms of , for an
21 LWR, and HTGR, a liquid-metal reactor, that's where
22 the technology-specific regulatory guides would come
23 in and say, okay, for an LWR, that means stay below
24 2200 degrees. For an LMR maybe some eutectic
25 temperature with the cladding. You know, whatever it

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1 turns out to be.

2 MR. APOSTOLAKIS: So are you saying, Tom,
3 that the reason why you want to define DBAs is Part
4 100?

5 MR. KING: Yeah, I think, that's one
6 reason.

7 MR. APOSTOLAKIS: What's the other?

8 MR. KING: I think the other reason is we
9 want to stay risk-informed. We want some
10 deterministic check on things, not strictly a risk-
11 based decision process.

12 MR. APOSTOLAKIS: Well, the point, okay,
13 after the, let's say in particular vendors trying to
14 market a particular design. Okay, they come to you
15 and they say we are proposing, here's our PRA and
16 we're proposing these to be the DBAs.

17 Now if somebody, let's say they sell it to
18 ten utilities. These ten Applicants now will use the
19 DBAs or the whole PRA or both?

20 MR. KING: Both, both. It's a -

21 MR. KRESS: You'll have to meet the risk
22 criteria, too.

23 MR. APOSTOLAKIS: But would the DBAs be
24 analyzed using conservative methods, like it's done
25 now, or would they still be analyzed using PRA

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1 realistic methods, but those methods will be
2 scrutinized to death by the staff because they're
3 DBAs?

4 MR. KING: Basically, what we've said is
5 across-the-board use best estimate methods. If it's
6 a DBA we want to use a 95 percent confidence
7 acceptance criteria, confidence level in comparing
8 against the acceptance criteria.

9 If it's a risk criteria, like a LERF, for
10 example, it would be using mean values. So we're
11 trying to do it in the level of confidence that you
12 would use in comparing your analysis, your best
13 estimate analysis against whatever the acceptance
14 criteria are.

15 MR. APOSTOLAKIS: And you would keep the
16 margins separate from the PRA?

17 MR. KING: Yes, yes. Now we are thinking
18 some guidance in the frame work and in the
19 requirements, in terms of qualified analytical tools,
20 how would you verify that the codes you were using are
21 good for the analysis you're using them for?

22 We're thinking we need to put some
23 guidance in. Exactly what that will say, we're sure
24 at this point, but it's not something we can duck.

25 MR. APOSTOLAKIS: Why would you separate

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1 the margins from the PRA? I mean there are
2 probabilities of failure, aren't they?

3 MS. DROUIN: Can I interject for something?
4 I'm getting very concerned about the time. We're only
5 on our second issue. We've got seven more to go. Not
6 that this isn't a great discussion, it wasn't the
7 intent of today's presentation to get into, you know,
8 the detailed technicals on all of these issues.

9 MR. APOSTOLAKIS: Yeah, but you should get
10 some input from us.

11 MS. DROUIN: Absolutely, it's not that I
12 don't want the input, I'm just asking do we want to be
13 able to get to all the other seven issues?

14 MR. KRESS: We might be able to bend on the
15 time a little bit.

16 MS. DROUIN: We are going to be coming back
17 to the Subcommittee in great detail to have these kind
18 of discussions.

19 MR. KRESS: Okay, there's really nothing
20 pressing where people have to be here following this.
21 It's almost internal stuff, so we, you know, I'm not
22 all that concerned myself about running over a little
23 bit.

24 MR. APOSTOLAKIS: As long as it's just a
25 little bit.

1 (Laughter.)

2 MR. KRESS: As long as it's not a whole
3 lot.

4 MR. APOSTOLAKIS: As long as Mario is not
5 here.

6 (Laughter.)

7 MR. KRESS: Mario is not here, no.

8 MR. WALLIS: I might be more strict than
9 Mario.

10 MR. KRESS: Oh, okay. Well, anyway, you
11 can go ahead because we'll worry about the time and
12 we'll just -

13 MS. DROUIN: Okay.

14 MR. KING: To go back to the margins
15 question, what we've talked about is putting margins
16 in the acceptance criteria. You know, you know where
17 your failure point is or you have some idea where it
18 is. Do you want to set your acceptance criteria some
19 distance away from that?

20 That's when you say margins, that's what
21 I'm thinking of.

22 MR. APOSTOLAKIS: Yeah, and I'm saying that
23 these could be incorporated in the PRA itself.

24 MR. KING: They could, they could. Yeah,
25 that's one thing we, PRAs traditionally don't do, they

1 don't -

2 MR. APOSTOLAKIS: Yeah, that's correct.

3 MR. KING: - put uncertain bounds on the
4 acceptance criteria. And that's, that's something to
5 think about. The other thing this section does, is it
6 proposes some technology neutral risk criteria that,
7 at this point, we're proposing would be surrogates for
8 the frequency consequence curve.

9 And Dr. Kress' question, can you do that?
10 Is a good one and I think we need to make sure the
11 workshop covers that point. But we've proposed some,
12 a couple of values in there for accident prevention
13 and for accident mitigation that we want to get out
14 and get some comments on.

15 We're developing a risk-informed approach
16 for safety classification. We want to build upon
17 5069. You won't see much detail in the current
18 framework, we're still working on that, but that's the
19 idea, to use risk insights for safety classifications.

20 Okay, let me move on to the next,
21 scenario-specific source terms. That's where you take
22 the PRA and you take those event sequences, the ones
23 you've identified for AOOs and for DBAs, as well as
24 the ones that you're going to use for the, in the rare
25 category for emergency plan considerations.

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1 And for each event sequence there could be
2 a different source term, depending upon what happens
3 to the fuel and what happens to the rest of the plant
4 during that event sequence.

5 So our scheme would allow a designer to
6 take credit for the plant performance and not just
7 have a one-size-fits-all source term like we almost
8 have now.

9 MR. POWERS: But would it be different
10 levels of core damage then, instead of just having a
11 CDF?

12 MR. KING: There could be different levels
13 of core damage, yes.

14 MR. POWERS: Since there are different
15 source terms.

16 MR. KING: Yes.

17 MR. POWERS: You want it just to have a
18 signal core damage frequency.

19 MR. KING: Yeah. It could be core damage
20 or it could be a breach in the primary cooling system,
21 if it lets more out, for example.

22 MR. DENNING: And you're thinking again
23 that you would have, for the design basis accidents
24 you would use that for site dose criterion of 25 REM?

25 MR. KING: Yes, whatever the source term is

1 from those things you call design-basis accidents.

2 MR. DENNING: And you're taking, one of the
3 things that has me very much concerned is that you
4 would take away a fair amount of defense and depth
5 that we currently have where we use surrogate source
6 term that doesn't really represent what we call
7 design-basis accidents.

8 Within your design-basis accidents, could
9 you include full core meltdown accidents at ten to the
10 minus five? Or is that precluded at ten to the minus
11 five?

12 MR. KING: We're saying for the things that
13 you call design-basis accidents, which the cut off is
14 ten to the minus fifth, we have a deterministic
15 criteria we're proposing that says no core melt
16 accidents in that range.

17 MR. DENNING: No core melt.

18 MR. KING: No core melt.

19 MR. DENNING: So you'd have only trivial
20 releases, probably -

21 MR. KING: Well, it could be cladding
22 failures, and it could be -

23 MR. POWERS: Well, not for prior part 100,
24 he has to take a substantial core damage if you're
25 going to use part, retain part 100. It's required to

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1 do a substantial core damage.

2 MR. DENNING: So that's my question.

3 MR. POWERS: It's part of the rule. If you
4 have, if you're going to use part 100, and not change,
5 as written now, you'd have to have a substantial core
6 damage.

7 It doesn't ask you what the probability
8 is, it just says a substantial core damage. And
9 that's been interpreted as release of some substantial
10 amount of, I mean a non-trivial amount of
11 radioactivity.

12 MR. DENNING: Well, that's what I'm trying
13 to find out, or are you saying we do away with part
14 100.

15 MR. KING: Well, not do away with part 100,
16 but not, not strictly apply that provision that says
17 you have to have substantial core damage.

18 MR. POWERS: That provision carries over
19 into the 50, is it 52, that's the advanced reactor,
20 specifically cool down?

21 MR. KING: Well, we're proposing to apply
22 that in a different fashion. To use your PRA
23 sequences and base your source term upon whatever ones
24 from the PRA you pick as design-basis accidents.

25 MR. KRESS: You're going to get real, is

1 what you're saying.

2 MR. KING: I'm going to get real.

3 MR. KRESS: And really all that source term
4 does is propose an artificial beacon train on the
5 container.

6 MR. KING: Yeah, that's what it's used for.

7 MR. DENNING: But please, recognizing PRA
8 space we scarcely look at the amount of fuel damage
9 accidents at all, because they're such a trivial
10 contributor to risk.

11 You know, so there hasn't been very much
12 looking at what's a realistic source term for a non-
13 core damage accident.

14 So, I mean I think the thought of
15 comparing that to 25 REM at the site dose, even site
16 boundary, if all we're talking about is our, you know,
17 clad failure events and stuff like that. Those are
18 really trivial consequence accidents and I don't think
19 they're appropriate for siting type of calculations.

20 Siting may not be the right term to you
21 now, but for example, for designing containment or
22 something like that. It's there for severe accidents
23 that are, in your vernacular here, are going to be
24 less than ten minus five per year.

25 MR. KING: We haven't neglected containment

1 and we haven't neglected severe accidents. You're
2 going to hear what the containment story is. We also
3 have, in probabilistic space and criteria for large
4 release frequency, that would look across all the
5 event categories and set some probabilistic goal or
6 criteria for when you can have a large fission product
7 release.

8 Which will affect your containment, it'll
9 affect your entire plant design.

10 MR. DENNING: Well, why are you bothering
11 to even look then at the source terms for these, these
12 trivial source terms from design-basis accidents. I
13 don't think, they're not really used to establish the
14 design for anything.

15 The, you know, the surrogate source term
16 that we currently use with design-basis accidents,
17 does establish the design for the containment. And we
18 create the containment and stuff like that.

19 MR. KING: When you're thinking LWRs, I
20 think you are making a valid point. When you start
21 thinking HTGRs and the design they have, you start to
22 get some sources from, from -

23 MR. KRESS: You get substantial amounts of
24 fission products that are tramped, fission products
25 that are plated out on the walls of the HTGR and are

1 floating around in the heating. And those are
2 significantly high.

3 MR. KING: Or a sodium plant, where the
4 sodium gets highly radioactive.

5 MR. KRESS: Sodium may do the same thing,
6 you know.

7 MR. KING: And you don't have to damage the
8 core to get a tremendous source term.

9 MR. DENNING: Well, sodium plant may be a
10 little bit different, particularly if you have a
11 sodium fire or something like that. But I don't, I
12 don't think, you know, as far as, LWRs are included in
13 part of this consideration.

14 And I think that we have to think about
15 what we were really using the design-basis accidents
16 for previously and what their function was.

17 And right now, if we use trivial source
18 terms associated with them, they don't serve that
19 function of protecting the public.

20 MR. KRESS: Most of the design-basis
21 accidents don't even deal with source terms.

22 MR. KING: Well, most of the, like the
23 large break LOCAs, they assume the core melt source
24 term, the same one that you do for part 100.

25 MR. DENNING: Right, it's a surrogate

1 because you've used the large-based LOCA, but
2 everybody knows it doesn't have that source term.

3 MR. KRESS: But it shows up on the
4 equipment qualifications and it shows up in things
5 like how good is your spray?

6 MR. KING: Containment design.

7 MR. KRESS: It shows up in the leakage rate
8 of the containment. It doesn't show up in the actual
9 size and strip of the containment, that's based on the
10 pressures that come out of there.

11 So they really don't, those source terms
12 really don't have a big impact on the design, it's the
13 design of fuel of the safety, I think has an impact on
14 the quantity of spray you have.

15 MR. KING: Well, they have an impact in the
16 sense that it sets diesel generator start times and
17 valve closure times and so forth on a stylized source
18 term.

19 MR. KRESS: Things it really shouldn't,
20 things that really shouldn't happen.

21 MR. KING: Right, things that may not, you
22 know, reflect realistic accident scenarios. We're
23 trying to be more realistic and your point is valid
24 that -

25 MR. DENNING: I'm willing to move on, but

1 I think you do have to recognize that's major
2 differences and also that these design-basis
3 accidents, in general, are going to have trivial
4 source terms.

5 It wouldn't serve the same function of
6 what we're doing today.

7 MR. KING: Okay. The thought I want to
8 leave you with is we haven't forgotten about
9 containment and we haven't forgotten about core melt
10 accidents in this process.

11 They will show up and they will affect the
12 design.

13 MR. POWERS: Let me turn to your comment on
14 verified analytic codes and this may be outside of the
15 scope of your particular work, but I'd be interested
16 in your thoughts on it.

17 I see lots and lots of these advance
18 reactors coming in with very, very novel fuels and
19 designs and things like that. And people saying that
20 there is, there's no efficient product release from
21 this, even though I heated up to plasma-level
22 temperatures and things like that.

23 And this is unbelievable stuff, and you
24 say well how did you come about that conclusion? And
25 they said well I've got a computer code, it's a

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1 wonderful computer code. And whatnot and so you ask
2 them well what experiments have you done, and they say
3 well I haven't done any experiments but there were
4 some German experiments done on fuel that has no
5 relationship to the fuel that I'm going to use, but it
6 looks about the same.

7 So, I, those must be those fuels, so
8 should wonderful things, even though they were
9 subjected to a temperature scenario that bore no
10 relationship to the temperature scenario I'm going to
11 subject it to.

12 The point being that the cost of
13 experimentation has gotten so high now, there's
14 reluctance to use experimental data even when we're
15 delving into very novel technologies where predicted
16 capabilities are sparse.

17 And people are, don't seem to have a good
18 criterion for saying when is it that your physics
19 embodied in your code may have all the right
20 equations, but I want to see an experiment.

21 Is that something that you deal with when
22 you say verified. Do you mean verified or validated
23 here against experiments?

24 MR. KING: Yes, that's something we're
25 trying to deal with. I don't have an answer for you,

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1 but it's one of the issues we've got to wrestle with.
2 What kind of criteria do we put in that's going to
3 essentially require some experimental verification of
4 what's being proposed.

5 And the flip side of that is what does NRC
6 want to do in terms of some confirmatory testing to
7 validate those things.

8 MR. POWERS: I presume NRC really can't
9 make that as a generic judgement until after they've
10 seen the application.

11 MR. KING: Right, right. And that's not
12 something we're going to put in a set of requirements,
13 but it's still an issue.

14 MR. DENNING: But please change that to
15 verify and validated, because -

16 MR. POWERS: Verified to me means you went
17 through and checked the code.

18 MR. KRESS: To see if you didn't make any
19 mistakes in coding.

20 MR. KING: Okay. CHAIRMAN

21 BONACA: Are we ready to move on?

22 MR. KING: It's an issue and there will
23 probably be a lot of arm-wrestling over the answer to
24 that issue.

25 MR. POWERS: Yeah, and how you decide when

1 you need experiments. I mean it's just not in the
2 source term, it's in a lot of other areas.

3 MR. KING: Okay.

4 MR. APOSTOLAKIS: Isn't that related to the
5 issue we were discussing earlier about the
6 uncertainties?

7 MR. KING: Umm hmm.

8 MR. APOSTOLAKIS: Not that I know how to do
9 it, but it seems to me they're related. The larger
10 the uncertainty, so, perhaps, the more controversial
11 the uncertainties are.

12 The more evidence you want from real world
13 to eliminate some of them.

14 MR. KING: Yeah. I mean in theory you
15 could say, well I'm just going to develop some
16 bounding source term and not worry about it anymore.

17 The designer could choose to do that, and
18 not go through the cost of a bunch of experiments and
19 code assessment. And that option is in the framework,
20 if they want to do that.

21 MR. POWERS: The trouble with the bounding
22 approach is that it's bounding for some applications
23 that, ipso facto is not bounding for others.

24 MR. KING: Yeah, it could cause some
25 problems in other areas, that's right.

1 MR. KRESS: One of the things we've talked
2 about off-line in a bar somewhere, is that should this
3 technology and neutral framework deal with the
4 sabotage of terrorist-type issues, safeguards?

5 One way it could is to say, well, your PRA
6 has to include that, would be one way to do it. And
7 then all your criteria would be okay. I mean, just,
8 it would be part of another set of sequences.

9 MR. KING: Umm hmm.

10 MR. KRESS: The other way is leave it out
11 altogether and deal with it separately. Do you have
12 any thoughts on how you're going to deal with that in
13 this?

14 MR. KING: We have a placeholder in here on
15 physical security.

16 MR. KRESS: Placeholder right now.

17 MR. KING: There is a separate paper being
18 written by NRR.

19 MS. DROUIN: We have a slide on this, we're
20 going to get to.

21 MR. KING: Yeah, we'll get to it.

22 MR. KRESS: Sorry, I didn't mean to jump
23 ahead.

24 MS. DROUIN: No, that's okay.

25 MR. KRESS: It's just that emergency -

1 MR. KING: What the Commission approved
2 last year in the EP area was we don't need to make any
3 near term changes in the EP area, for things like the
4 pebble bed, because, one, the regulations already
5 provide some flexibility for HTGRs in the EP area.

6 But they did agree in the longer term,
7 when we're thinking about defense and depth, think
8 about how EP fits into that and they approved us
9 thinking about some criteria that could be used to
10 make an assessment on whether to change the emergency
11 planning zone, with keeping defense and depth in mind.

12 So that's what we've been trying to do in
13 this framework, and we've come up with some criteria
14 that are in the framework. They're not on this slide,
15 because we want to give the Commission a chance to
16 look at them before we put them out for everybody else
17 to look at.

18 But assuming the Commission sees this
19 paper and doesn't object to us putting those out, they
20 will be contained in the framework that will be one of
21 the topics discussed at the March workshop. So, at
22 that, I'll just leave it at that for now.

23 MR. DENNING: Quick comment. And that is
24 I think emergency planning is overrated as far as its,
25 I think from a risk-informed viewpoint, if you look at

1 the values of evacuation, that emergency planning is,
2 many people think that's it's really, really
3 important.

4 If you look at risk studies, as in NUREG
5 1150, and see what are the advantages of having rapid
6 evacuation verses not evacuating and this kind of
7 stuff. See, it doesn't really buy you that much in
8 risk space.

9 People's perception is quite the opposite
10 and they look at it as important defense and depth and
11 some of the Commissioners, I know, think it's really,
12 really important.

13 The reality is, for risk-informed, I don't
14 think it's really that important. If we look at
15 driving down core damage frequencies and lower source
16 trends, if we really, you know, although Dana really
17 doubts some these potential, it isn't at all clear.

18 You really need emergency planning zones.
19 That they buy you anything really in a risk-based,
20 look at this in comparison to their cost.

21 MR. POWERS: I find that remarkable. I
22 find that just absolutely stunning statement.

23 MR. APOSTOLAKIS: I thought that we
24 distinguished between late and early releases, based
25 on whether there's time to evacuate. So it should

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1 make a difference.

2 MR. DENNING: Well, it does make some
3 difference, but if you look at NUREG 1150 and you do
4 the sensitivity studies, and they're in there, in
5 NUREG 1150, the sensitivity studies, for some, it
6 doesn't make any difference at all.

7 Like the Sequoia, no difference at all,
8 because they had early releases all the time. And so
9 they were just as good to sit there and shelter.

10 Now it is important to go in and relocate
11 after the passing cloud. But if you look at the value
12 of emergency planning actions, in the sensitivity
13 studies done in NUREG 1150, it buys you something like
14 factor 4 on early fatalities for typical large drives
15 and stuff like that.

16 In comparison with its cost, it isn't
17 clear to me that for future plant designs it's
18 necessarily warranted. So I think you have to allow
19 the possibility that you've got a plant design with
20 low enough core damage frequency and release
21 characteristics that are such that, you necessarily -

22 MR. KING: Well, our approach is one, there
23 needs to be some baseline emergency planning and then
24 bang on your plant characteristics how much more over
25 and above that do you need? That's our basic

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1 approach.

2 But, again, I won't get into the details
3 here. We're going to have plenty of time later to
4 talk about that.

5 MR. KRESS: That could be viewed strictly
6 and defense and depth and may not need it for risk
7 consideration. But it's there because what if I'm
8 wrong.

9 MR. DENNING: But I think you can look at
10 the results of sensitivity studies and see does it
11 really make that much difference or doesn't it?

12 MR. KING: Okay, let me move on.

13 MR. APOSTOLAKIS: We do other things on
14 risk basis.

15 MR. KING: Integrated risk, the next two -

16 MR. POWERS: The only way I get away from
17 prompt fatalities and most severe accidents is by
18 evacuation. It's the only way I can do it.

19 MR. DENNING: Well, Dana, I challenge you
20 to look at NUREG 1150, and look at those and there
21 aren't that many prompt fatalities.

22 MR. POWERS: Because they evacuated.

23 (Laughter.)

24 MR. DENNING: No, not in the sensitivity
25 studies in which they don't evacuate and just shelter.

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1 MR. POWERS: I have looked at the
2 sheltering capabilities for frame houses, large
3 concrete houses, subterranean concrete structures and
4 one other facility and they give you a factor of two
5 dose reduction.

6 MR. DENNING: And in many accident
7 sequences you just don't have that large of a source
8 term. It's the large, early releases that have the
9 big source term, as well as not giving you much time
10 for evacuation.

11 But the source terms vary tremendously,
12 depending upon how long the containment stays intact,
13 well, particularly if it doesn't fail at all. Sorry.

14 MR. KING: Integrated risk. I think we've
15 had our controversy on this and our approach is, in
16 the framework at this point we're dealing with
17 integrated risk for modular units only.

18 We acknowledge the ACRS letter and the
19 differing views. What we want to do is talk about
20 those in the March workshop. We've got specific
21 questions in the draft Federal Register Notice to get
22 others views on that, to see whether we want to extend
23 that to non-modular plants, and deal with it on a
24 site-basis or a nationwide-basis. So we felt we
25 needed some more input before we were ready to tackle

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1 the ACRS letter.

2 But on the second, the next page, for
3 modular plants, basically we're saying is that we feel
4 integrated risk does need to be considered. For
5 accident prevention, it would be considered primarily
6 on a frequency basis.

7 It wouldn't matter what size the module
8 was. And there is a definition of modular plants, by
9 the way, that's in the frame work, it's the same one
10 that's in the proposed Energy Bill.

11 So there is some limitations on what do I
12 mean by a modular reactor. Excuse me?

13 MR. APOSTOLAKIS: Is this still proposed?
14 I thought it was approved?

15 MR. KING: No, as far as I know, the Energy
16 Bill has not been approved, it's still proposed.

17 MR. KRESS: If you stuck strictly with an
18 FC curve, the question wouldn't come up.

19 MR. KING: Well, I'm not sure it wouldn't
20 come up. Again, do you call an individual module a
21 reactor or do you call that group of modules that's -

22 MR. KRESS: You just have an FC criteria
23 for all of them.

24 MR. KING: So it doesn't matter what size
25 they are, they all have to meet the same thing?

1 MR. KRESS: Yeah.

2 MR. KING: But then how do you integrate?
3 You don't deal with integration at all, is what you're
4 saying? That's one way to do it.

5 MR. KRESS: The FC curve takes care of it.
6 It takes care of it automatically.

7 MR. APOSTOLAKIS: But that's for the site,
8 not for individual margins. The FC curve should be
9 for the site.

10 MR. KRESS: Yeah.

11 MR. APOSTOLAKIS: But then there is the
12 additional question of what do you do about the core
13 damage frequency of each module? And that's where the
14 ACRS was split.

15 MR. KING: Yeah, the frequency -

16 MR. APOSTOLAKIS: The FC curve doesn't take
17 care of that because the defense and depth thing says
18 you also have to worry about core damage, at least.
19 Right?

20 MR. KING: Right.

21 MR. KRESS: Yeah, I understand.

22 MR. KING: Yeah, and we're saying you need
23 to deal with both.

24 MR. APOSTOLAKIS: I don't think we
25 disagreed when it came to the site criteria for the

1 release, right? There was no disagreement there. The
2 disagreement was on the core damage frequency.

3 MR. KING: No, you're right, that's what
4 your letter said.

5 MR. APOSTOLAKIS: What I don't remember is
6 which side I was on.

7 (Laughter.)

8 MR. POWERS: It seems to me that in recent
9 discussions on advance reactors, the concept of
10 modular reactors has fallen substantially from favor
11 relative to where it was when you guys started. Is
12 that your perception as well?

13 MR. KING: Yeah, I think it's, the interest
14 has decreased somewhat. It hasn't gone away. The
15 pebble bed folks are planning, we got a letter from
16 them recently.

17 They're planning to come back in and
18 reactivate the review. The IRS people are still
19 talking about doing a review. But you're right, the
20 ones that are now undergoing certification are large
21 plants.

22 MR. APOSTOLAKIS: The gas cold fast reactor
23 was talking about 300 megawatt.

24 MR. KING: Yeah, that falls under modular.

25 MR. APOSTOLAKIS: Modulars are 300? So

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1 they're still talking about modular.

2 MR. POWERS: If they can get rid of their
3 core instability problem.

4 MR. KRESS: George, when I said that FC
5 Curves could take care of it, you can have two types
6 of FC Curves. You can talk about the frequency of
7 release of fission products from the fuel.

8 MR. APOSTOLAKIS: Oh, okay.

9 MR. KRESS: That's a type of FC Curve.

10 MR. APOSTOLAKIS: Okay, okay.

11 MR. KRESS: And if you set a limit on that,
12 then that would take care of your CDF automatically
13 because fuel may be dispersed into modules, or maybe
14 one big one, or maybe part of the spent fuel pool.

15 So what you need is if you're going to
16 have two sets of criteria for LERF and the CDF, you
17 need two sets of FC Curves.

18 And I think I've said that in one of the
19 little write-ups I gave you on things that you should
20 be focusing on the fission products. And this is a
21 way to do it.

22 To get this, to get this integration, that
23 would be one way to do it. So you can take that as a
24 suggestion from me.

25 MR. KING: Okay.

1 MR. KRESS: Rather than talking about CDF,
2 talk about the frequency release from fuel first.

3 MR. KING: Okay.

4 MR. APOSTOLAKIS: I really wonder how, what
5 that curve would look like?

6 MR. KRESS: It would be interesting.

7 MR. APOSTOLAKIS: The shape probably would
8 be funny. It's not going to be that smooth thing we
9 are used to seeing.

10 MR. KING: It's going to go the other way.
11 Instead of coming down, it's going to go up.
12 Frequency gets lower, the amount you can release gets
13 higher.

14 MR. APOSTOLAKIS: Yes, yes. But that's the
15 same -

16 MR. KING: It's an interesting concept.

17 MR. KRESS: At least it's a thought, we can
18 give some thought to it. Maybe that's a better
19 definition than the CDF.

20 MR. APOSTOLAKIS: It probably would be very
21 steep. Then once you start releasing, then very
22 quickly you're releasing too much. So, instead of
23 some, but we can take the logarithm with the
24 logarithm, can't we. We can always smooth the top.

25 MR. KRESS: Anyway, that gives you

1 something to think about.

2 MR. DENNING: Let me make another comment
3 that you don't like. And that is that the focus
4 should really be on those radio nuclides that affect
5 latent cancer fatalities rather than early fatalities.

6 I noticed that in here there's a, you're
7 looking at earlies. From a risk viewpoint, you know,
8 we look at individual risk for both. If you look at
9 severe accident scenarios, the number of predicted
10 latent cancer fatalities is hugely bigger than the
11 number of early fatalities.

12 Hugely. Ten to the fourth, something like
13 that. Some of that may be a little bit unreal,
14 because it involves low doses and linear threshold
15 theories. So if you take that rationale, then I think
16 what you really do is you focus on cesium, for
17 example, and you focus on -

18 MR. KRESS: I think they're focusing on
19 dose. And if you look at their FC curves they come up
20 with, and their rationale for how they deal with
21 latent cancers, they have a good approach.

22 And I really congratulate you on that part
23 of it.

24 MR. DENNING: Population dose -

25 MR. KRESS: Yeah.

1 MR. DENNING: - you're saying? Well, then
2 you would be focused on -

3 MR. KRESS: The only thing I didn't see in
4 that, they talked about latent cancers. They didn't
5 really deal with the total deaths the same way.

6 MR. KING: No, we don't deal with total
7 deaths, but these -

8 MR. KRESS: Then I'd like to see that, to
9 tell the truth. Use the same process you use for the
10 latent cancers and see what you come up with for total
11 deaths.

12 MR. KING: The lower end of the Frequency
13 Consequence Curve is based upon dose that would
14 trigger an early fatality. But the area under the
15 curve is based upon preserving the latent fatality
16 QHO. So we try to deal with both.

17 MR. KRESS: I really -

18 MR. DENNING: No I'm not talking about, I
19 wanted to make the important it's not the distinction,
20 not the individual fatality. It's looking at the
21 total consequences of the accident and that's quite
22 different.

23 And there is where you see this tremendous
24 dominance of latent cancer fatalities versus early
25 fatalities and those radio nuclides that contribute to

1 large population doses as being the things that really
2 dominate those.

3 If you take that philosophy, then if you
4 look at core damage frequency, you would megawatt, you
5 would megawatt average or weight your core damage
6 frequencies in modular reactors.

7 MR. KRESS: Yeah, but we've always seen
8 core damage frequency limits or acceptance criteria as
9 being divorced completely from consequences.

10 MR. DENNING: But when you get to modular
11 reactors and you're asking this question of how do you
12 deal with core damage frequency, the way you would do
13 it you, would be, you would megawatt base it.

14 Megawatt weight, the core damage
15 frequencies if you're going to come up with a single
16 measure.

17 MR. KING: We are proposing that for
18 accident mitigation.

19 MR. DENNING: Because the total megawatts
20 of cesium are largely dependent upon the total
21 megawatts.

22 MR. KRESS: Oh.

23 MR. KING: Well, we are proposing a
24 megawatt weighting when we get to mitigation. But
25 we're not when we get to prevention.

1 MR. KRESS: I don't think you want to do it
2 for prevention. I like my suggestion better, that you
3 need some sort of FC Curve for prevention.

4 MR. KING: That's an interesting idea,
5 we'll think about that.

6 MR. ROSEN: I understand we're talking
7 about health consequences here. But is there any
8 question to begin to talk about societal consequences
9 beyond health, like land contamination issues?

10 Economic consequences? Is that all in
11 this framework?

12 MR. KING: What we've tried to make, yeah.
13 You'll see in the framework dealing with, there is a
14 section on land, I don't know if we caught land
15 contamination, but it looks at land contamination from
16 the standpoint of, if we meet, if the future designs
17 meet the risk criteria we're proposing in here, what's
18 that mean for land contamination.

19 And the benchmark we use to compare it
20 against, is the extraordinary nuclear occurrence
21 criteria that are in 10 CFR Part 140, as sort of the
22 threshold we want to stay below.

23 And given the frequencies we're proposing,
24 we try to make the case that you will not exceed the
25 extraordinary nuclear occurrence criteria.

1 MR. KRESS: That was a very interesting
2 section. I thought there was some good stuff in
3 there. I think you can use the same approach for
4 total deaths.

5 Yeah, what we're trying to do is set the
6 level of the FC Curve. And so we can meet all these
7 criteria at the same time. And one or more of them is
8 going to control it.

9 I don't know which one. I think it would
10 be, in terms, when you look at it from the standpoint
11 of dollars, like you did, I think that's a great idea,
12 a wonderful idea. I made a talk once suggesting that.

13 CHAIRMAN BONACA: Just one word. We have,
14 we're not even through half the presentation and we
15 have ten minutes scheduled.

16 So, even if we are going beyond that,
17 there isn't, so let's try to remind us.

18 MR. KING: Yeah, I think maybe we ought to
19 move on. We'll go to containment. Stu is going to
20 talk about that.

21 MR. RUBIN: Yeah, okay. Fortunately, we
22 have an issue here that's not all that controversial
23 like the others. Stu Rubin, Office of Research.

24 What I'll be covering in the next four
25 slides is where the staff is at this point on our

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1 efforts to develop functional performance requirements
2 and criteria for containments for new plants.

3 This is a Commission policy issue,
4 obviously and an important defense and depth issue for
5 the framework. And it's particularly important for
6 HTGRs in their licensing.

7 As background, as shown on this slide, in
8 the SRM on SECY 030047, the Commission directed the
9 staff to develop some performance requirements and
10 criteria for these new plant containment designs.

11 And to do it in a way that accounts for
12 the design and the performance characteristics of
13 important SSCs in features such as the fuel and the
14 core and heat removal systems.

15 And the Commission also directed the staff
16 that we should work with designers and experts in the
17 new plant arena, as well as other stakeholders, in
18 coming up with these proposals for requirements and
19 criteria.

20 And then to submit options on these
21 requirements and criteria. Now as far as the approach
22 is concerned, it's kind of summarized on this next
23 slide. The approach that was taken to develop and
24 assess the various containment function or performance
25 options, was first to identify, with the help of

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1 stakeholders, all of the functional areas where a
2 containment would have or contribute to a safety role.

3 And some of the functional roles that were
4 identified through the workshops and other means, were
5 reducing radio nuclide releases to the environment.

6 Protecting risk-important SSCs from
7 internal and external hazards. Protecting on-site
8 workers from on-site radiation hazards. The next step
9 in the process was to develop a specific proposed
10 performance requirements for each of the identified
11 functions.

12 And to try to state it in a way that was
13 technology neutral and risk-informed and performance
14 based.

15 MR. WALLIS: Could you address the issue of
16 whether or not you need a containment at all?

17 MR. RUBIN: Yes, because if you go through
18 the functions, there is a placeholder there for, and
19 I assume you mean reducing radio nuclide releases to
20 the environment -

21 MR. WALLIS: I was thinking about the AP-
22 600. I mean if you believe the risk numbers the
23 containment is worth 700 bucks a year or something.
24 And you would never invest in that.

25 MR. RUBIN: But the performance requirement

1 will kind of, it's performance based. And if there is
2 a float in terms of how -

3 MR. WALLIS: Yeah, but there's no
4 performance to be desired, because nothing will ever
5 happen, why do you need the containment?

6 MR. RUBIN: Well, I mean it is a defense
7 and depth issue.

8 MR. WALLIS: Okay, that's what I asked.

9 MR. APOSTOLAKIS: How much of that is
10 enough?

11 MR. RUBIN: And how much of that is enough,
12 and that plays out in the options.

13 MR. WALLIS: That's the big issue.

14 MR. RUBIN: That's the big issue.

15 MR. WALLIS: - signs may come up with no
16 containment.

17 MR. RUBIN: How do you write this
18 performance -

19 CHAIRMAN BONACA: - the public will have a
20 lot to say.

21 MR. ROSEN: Well, how do you do performance
22 requirements for something that has no function?

23 MR. RUBIN: Well, take a look at the
24 statement and then we'll decide if there really is, in
25 fact, a null requirement or some positive value on the

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1 requirement, just to get to that.

2 The technology neutral statement that was
3 developed for reducing radio nuclide releases was the
4 containment must reduce radio nuclide releases to the
5 environment sufficiently, so that the dose predicted
6 for each of the events in the event categories meets
7 the dose criteria.

8 Now what does sufficiently mean? In some
9 plant designs, designers would argue that sufficiently
10 means no reduction required, okay? If you go into, is
11 that really accounting for defense and depth, it may
12 or may not, in conclusion.

13 In fact, HTGRs would tell you that the
14 reduction of radio nuclide releases is not required or
15 is not important in terms of the functions that
16 containments provide for that design.

17 MR. APOSTOLAKIS: But didn't the technology
18 framework, in one of its incarnations, have
19 requirements regarding mitigation and prevention?

20 MR. RUBIN: Yes.

21 MR. KING: It still does.

22 MR. RUBIN: Yes, yes.

23 MR. APOSTOLAKIS: So why -

24 MR. RUBIN: Yes, I'm going to get to that,
25 that point.

1 MR. APOSTOLAKIS: So that means there is a
2 containment, doesn't it? I mean why are we discussing
3 the absence of a containment.

4 MR. KING: Well, HTGRs arguably some of
5 them do, but you know you can do it with a
6 confinement.

7 MR. APOSTOLAKIS: Oh, confinement.

8 MR. KING: You can meet those numbers with
9 a confinement.

10 MR. APOSTOLAKIS: Is that what you meant?

11 MR. RUBIN: Don't get hung up on the term
12 containment.

13 MR. APOSTOLAKIS: No, he meant completely.

14 MR. RUBIN: That's a third level barrier,
15 I like to use that term.

16 MR. APOSTOLAKIS: Yeah, that is a
17 structuralist defense and depth measure.

18 CHAIRMAN BONACA: Let me propose that in
19 that case you would have the public to deal with. I
20 mean, I think that the rationalist considerations are,
21 you know, more important than if you're inside the
22 core and all that kind of thing, unless you come close
23 to the issue of the containment, emergency plan,
24 etcetera. You have to convince the states.

25 MR. APOSTOLAKIS: It will cost you more to

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1 convince the public, than actually building the
2 containment.

3 CHAIRMAN BONACA: Absolutely.

4 (Laughter.)

5 MR. APOSTOLAKIS: I think that's what's
6 going to happen.

7 MR. KRESS: But the HTGR people claim that
8 there, that the containment detracts from safety
9 because it ruins their alternate heat. And there is
10 a, there is a basis for that.

11 MR. RUBIN: And we took account of those
12 comments by developing metrics. And one of the
13 metrics that we identified was does the option have a
14 potential adverse on effect on safety.

15 That was one of the metrics that we used.
16 Another was the flexibility and there are many. So,
17 in some designs that was a negative in terms of the
18 metric that we had.

19 Okay, so needless to say, we did have
20 metrics in developing our options. Now the options is
21 where really the, and let's just turn to the options
22 page, thank you.

23 We have four performance options or
24 standards on how that statement or requirement would
25 be met. And each performance standard demonstrates,

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1 provides, in turn, greater defense and depth for
2 unknowns and uncertainties.

3 And greater capability to reduce radio
4 nuclide releases.

5 MR. WALLIS: Suppose that one and two don't
6 give rise to any source term, when you actually
7 analyze the ideal reaction?

8 MR. RUBIN: Well, that's right. I think
9 these were comments made on some of the new plant
10 designs. Option one, you might not need a
11 containment, with option one.

12 I think that's right. If you just hone in
13 on the events that are more within the frequency ban
14 for design basis events, then you're not going to need
15 a containment.

16 Now, what Option two says, though, is that
17 we're going to look at those events, but we're also
18 going to select credible events that have a potential
19 for a large consequence source term.

20 Now this is getting now to the traditional
21 way of looking at design basis events.

22 MR. WALLIS: This is incredible because the
23 contention of the designer will be that the likelihood
24 is so small that it's incredible.

25 MR. RUBIN: Well, I can't answer the

1 question today. It's going to be something that's
2 going to be looked at, at the time a design is
3 proposed and they will say this is our frequency, it's
4 ten to the minus eleventh.

5 And the staff will say, no, I don't think
6 so, for this reason. And those high consequence
7 scenarios will have to be decided if they will be
8 flected up into the design basis category.

9 And so that's the essence of Option two.
10 It includes, what some people call these cliff-edge
11 events, where the consequences really start to
12 increase steeply.

13 MR. WALLIS: Well, you have a lot of
14 problem now and you can't make your leak tight without
15 knowing something about the pressure inside it. And
16 if you've got an accident which will never happen,
17 you'll never get any pressure inside it and -

18 MR. RUBIN: Okay, are you on Option four?
19 I haven't gotten to Option four yet.

20 MR. WALLIS: I was just wondering how you
21 apply these here. Now, I haven't gotten to Option 4,
22 sure.

23 MR. RUBIN: Okay, well Option 3 is the same
24 events that you would look at in Option 2, but in
25 addition you would require that the containment have

1 a capability for controlled leakage and controlled
2 release of the delayed accident source term.

3 That would provide additional
4 structuralist defense and depth for unknowns and the
5 events that you consider.

6 MR. ROSEN: You used the word leakage, do
7 you treatment then leakage? Such as in a filtered and
8 then containment?

9 MR. RUBIN: Not necessarily.

10 MR. ROSEN: So there's no requirement for
11 treatment of the -

12 MR. RUBIN: No, not at this point, no. But
13 you still have to, you still have to meet the
14 required, the dose limit, in any event.

15 MR. ROSEN: Oh, yeah, but if you're talking
16 about defense and depth, even though you meet the dose
17 limits, if you want a leak, have the capability of the
18 controlled leakage, before you can do that you must
19 filter whatever it is you intend to leak. I mean that
20 would be one way to go about it.

21 MR. RUBIN: Yes.

22 MR. ROSEN: That's not what you have.

23 MR. WALLIS: Maybe controlled leakage
24 implies that the control -

25 MR. ROSEN: Well, that's what I was asking

1 and he said no.

2 MR. WALLIS: I think it should.

3 MR. KING: Or it could or it could just be
4 a very leak tight building that controls it that way.
5 You can do it either way.

6 MR. WALLIS: That's Number 4.

7 MR. RUBIN: Yeah, well Number 4 is
8 traditional light water reactor containment which is
9 essentially leak-tight for both the prompt and the
10 delayed source term.

11 And I didn't get into the pros and cons
12 for each of these options. They're laid out in the
13 paper and you can read what those are. At this point,
14 our view is that Option three is the best option among
15 the four, given the pros and cons that you would look
16 at.

17 It would involve a substantial
18 structuralist component to defense and depth, and with
19 that kind of requirement, the fission product
20 reduction capability would not depend on the
21 performance of any of the other barriers, mechanistic
22 barriers.

23 And so you would have additional -

24 MR. WALLIS: It all depends on what kind of
25 accident you're going to postulate which will provide

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1 the maximum challenge to this.

2 MR. RUBIN: Yeah, you'd have to look at the
3 specific design, that's right. And pick the events
4 that have potentially high source term, but are
5 credible.

6 MR. APOSTOLAKIS: I wonder whether it's the
7 Commission's philosophy not to depend on a single
8 element. I think it's the Regulatory Guide 1174
9 philosophy.

10 MR. RUBIN: That's three and four. Three
11 and four is a structuralist--

12 MR. APOSTOLAKIS: No, I understand that.
13 But, I mean, it says the second bullet there is
14 consistent with the Commission's defense and depth
15 philosophy which provides a safety function should not
16 depend on a single element.

17 Has the Commission ever said this? I
18 don't think so. I think it was in -

19 MR. KRESS: I think in the white paper it
20 was written.

21 MR. APOSTOLAKIS: No, it was, no, they
22 defined it differently there. They said it's the
23 provision of multiple barriers to prevent accidents
24 from happening or mitigating when, if they happen.
25 But this particular thing of not depending on a single

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1 element, I think is Regulatory Guide 1174.

2 MR. KING: It is in, I think if you look at
3 the current strategic plan of the Commission, this
4 definition is in there.

5 MR. APOSTOLAKIS: Well, I'd like to see
6 that.

7 MR. KRESS: I've seen it somewhere.

8 MR. KING: It is, the Commission has put
9 these words out.

10 MR. RUBIN: Okay, at this point we plan to
11 engage stakeholders in March on this topic as well,
12 and take a look at the options, the evaluation of the
13 options and clearly it will be an important element of
14 defense and depth to the frame work when it's decided.

15 MR. DENNING: Does it have any function of
16 keeping things out, as well as keeping things in?

17 MR. KRESS: Yeah, I think that's one of the
18 functions. He didn't list it on that slide -

19 MR. ROSEN: Hopefully the next time we meet
20 we'll get more detail-specific.

21 (Everyone is talking at once.)

22 MR. APOSTOLAKIS: So what's going on? Where
23 are we? Oh, are we done?

24 MR. RUBIN: No, I'm done with my part. Tom
25 still has a part -

1 MS. DROUIN: No, with containment we're
2 done.

3 MR. KING: I wanted to get back to Steve's
4 question just for 30 seconds, having to do with
5 societal, how we deal with societal risk and land
6 contamination.

7 MS. DROUIN: I'm timing you.

8 (Laughter.)

9 MR. KING: And I mentioned the
10 extraordinary nuclear occurrence criteria, which if
11 they're exceeded triggers Price Anderson, which is
12 when society starts paying for the clean-up.

13 So what we've done is tried to make the
14 case that the criteria we've got in here will keep you
15 from exceeding. And extraordinary nuclear occurrence
16 talks about dollars, has some criteria for clean-up
17 cost as well as land contamination, square meters of
18 land contamination.

19 So we tried to make the case that if you
20 meet these criteria you don't exceed the extraordinary
21 nuclear clearance criteria, therefore you're dealing
22 with a societal issue, and you don't need anything
23 special to deal with it.

24 So that's, in a nutshell, what we're
25 trying to do.

1 CHAIRMAN BONACA: I don't think you deal
2 with it as a societal issue. I mean once you have an
3 accident of that type that's, you know, you have to
4 account for much more than that.

5 MR. ROSEN: You have dealt with one aspect
6 of society.

7 MR. KING: One aspect of society.

8 CHAIRMAN BONACA: One little aspect, and
9 then you have all the cascading.

10 MR. APOSTOLAKIS: The question really is,
11 isn't it, I mean if you have a land contamination
12 goals, would that require us to do something to the
13 plant that now we are not doing? That's really the
14 question.

15 MR. ROSEN: Exactly, exactly. And what Tom
16 is saying is that that's not going to happen, because
17 of the way they've set it.

18 MR. APOSTOLAKIS: Yeah.

19 MR. ROSEN: They've set these other
20 criteria, so you'll never trigger the extraordinary
21 nuclear events.

22 MR. APOSTOLAKIS: So maybe that's something
23 to think about?

24 MR. ROSEN: Nothing is never.

25 MR. APOSTOLAKIS: Whether there is

1 something missing as a result of us not having a land
2 contamination objective. Although the Commission in
3 the past, I believe, was not too agreeable to
4 establishing something.

5 But that was for light water reactors,
6 that was for light water reactors, yeah.

7 MR. KING: We looked at the safety goals.

8 MR. APOSTOLAKIS: Yeah, and they said no.
9 Would cesium be involved in that, do you think?

10 MR. KING: Let's move on.'

11 MS. DROUIN: Well, we're out of time. We're
12 five minutes over our time.

13 MR. KRESS: Shame on you.

14 MS. DROUIN: Shame on me, absolutely. It
15 always is. Level of safety. I don't know all the
16 issues are controversial but this issue seems to have
17 taken, at least with the public, probably the biggest
18 controversy.

19 The Commission, in their SRM to the SECY
20 paper, did approve the staff's recommendation on
21 implementation of the Commission's expectation for
22 enhanced safety for advance reactors.

23 So we do have an advanced reactor policy
24 statement that states the Commission's expectations.
25 So the question on our part is how do we implement and

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1 achieve this expectation?

2 What we have done is to try and adopt an
3 approach in the frame work that says we're going to
4 meet that enhanced expectation by meeting the safety
5 goals.

6 It has a lot of controversy and I expect
7 to see a lot of discussion on this in our March
8 workshop.

9 MR. KRESS: But you know you've got to come
10 down on something and that's probably the best, you
11 know, what else are you going to choose.

12 It's either define a new one or to accept
13 that one.

14 MS. DROUIN: Well, this is key because this
15 starts at the very foundation of our structure, of our
16 safety philosophy. And if we change this, then it's
17 going to, you know, have a domino effect -

18 MR. KRESS: Sure.

19 MS. DROUIN: - all the way through the
20 whole framework document.

21 MR. APOSTOLAKIS: The level of safety -

22 MR. KRESS: I think that basically we're
23 saying that's how safe is safe with us.

24 MS. DROUIN: Yes.

25 MR. APOSTOLAKIS: So you're, I guess I

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1 missed it. Are you saying that the frame work will be
2 written in such a way that the current QHOs will be
3 satisfied?

4 MS. DROUIN: Yes.

5 MR. KRESS: The FC Curve -

6 MR. APOSTOLAKIS: Because don't forget that
7 it's -

8 MR. KRESS: the FC Curves will satisfy the
9 QHO.

10 MR. APOSTOLAKIS: Yeah, yeah.

11 MS. DROUIN: Right.

12 MR. APOSTOLAKIS: But the current goals,
13 not, and then they will say there is expectations that
14 you will do better. But don't forget there's an
15 important element in all this, which will not affect
16 the frame work.

17 But there is a tough competition out there
18 among designers.

19 MR. KRESS: VPR?

20 MR. APOSTOLAKIS: Down selecting, no the
21 Gen 4.

22 MR. KRESS: The Gen 4 people.

23 MR. APOSTOLAKIS: So they're going to fight
24 to do better, I'll tell you. They have economic
25 incentive for doing better.

1 MR. KRESS: Good.

2 MS. DROUIN: Good.

3 MR. APOSTOLAKIS: Because, you know, the
4 DOE will select one, I don't know, in a few years.

5 MR. KING: And that's the argument we get
6 back. We're going to do it so you don't have to
7 require it.

8 MR. APOSTOLAKIS: Yeah, that's right.

9 MR. KING: So, it's an issue of expectation
10 versus requirement.

11 MR. DENNING: Well, let's recognize also
12 how easy it is to satisfy the quantitative safety
13 goals.

14 MR. APOSTOLAKIS: I don't know about that,
15 Rich.

16 MR. DENNING: Well, look at NUREG 1150 and
17 -

18 MR. APOSTOLAKIS: I look at NUREG.

19 MR. DENNING: - you believe that those
20 plants, and with large margin they satisfy.

21 MR. APOSTOLAKIS: Do you think they satisfy
22 the condition -

23 (Several people talking at once.)

24 MS. DROUIN: Rich, not to delay today's
25 discussion, but I would encourage you to go read a

1 chapter in 1560, which uses the results of 1150 to
2 show there are quite a few plants that don't meet the
3 safety goals.

4 MR. DENNING: Ones other than in NUREG
5 1150, are saying if you apply the same thing to other
6 plants, you're saying?

7 MS. DROUIN: Yes.

8 MR. DENNING: Other than the NUREG 1150?

9 MS. DROUIN: Yes.

10 MR. DENNING: So I'm over oriented towards
11 those specific plants.

12 MR. POWERS: I will go on and argue that in
13 many, many cases you can show that perhaps even for
14 the NUREG 1150, when I take into account fire, seismic
15 and shut-down risk, don't meet the safety at all.

16 MR. APOSTOLAKIS: If the two plants that
17 did, though, do meet them? There were two plants for
18 which we did have a seismic. That was Peach Bottom
19 and -

20 MS. DROUIN: And Surrey.

21 MR. APOSTOLAKIS: I don't know.

22 MS. DROUIN: No, Peach Bottom and Surrey.

23 MR. APOSTOLAKIS: Even for those?

24 MS. DROUIN: For those, for the full scope
25 when you did the seismic and the fire and the low

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1 power shut-down.

2 MR. APOSTOLAKIS: Did they -

3 MS. DROUIN: I can't say, I'm not sure
4 about the low power shut-down, but I know for seismic
5 and fire they did.

6 MR. APOSTOLAKIS: They did? They did meet
7 them?

8 MS. DROUIN: Yeah, yeah.

9 MR. ROSEN: Okay, we've got ten more
10 minutes, that's it.

11 MS. DROUIN: Okay, I think I can get
12 through these next ones pretty quick. Physical
13 protection. We originally were treating this in it,
14 but at this point we have deferred it in this paper,
15 in the frame work. And the reason why is that there
16 is a separate paper being developed right now on this
17 issue.

18 Whatever the Commission directs, that
19 comes out of that paper, is what we will implement in
20 the frame work.

21 MR. ROSEN: Is this the same Commission
22 Security Paper that's being written to be used in
23 conjunction with 5046? We've heard about that in
24 several different contexts in the last few days.

25 MS. DROUIN: I don't believe so.

1 MR. ROSEN: About a paper, a paper that's
2 being written in security. So it doesn't have to be
3 considered, for instance, credit for manual actions in
4 fire, no security because it's in this paper.

5 5046, no security because it's in this
6 paper. Now new reactors, technology neutral frame
7 work, no security because it's in a paper. And I'm
8 trying to figure out if it's the same paper?

9 MS. DROUIN: I do not believe it's the same
10 paper. But I don't know, Jerry, if you want to -
11 maybe not.

12 Selective implementation was raised as a
13 potential policy issue. At this point we are saying
14 it's not a policy issue, because we are not saying
15 that you aren't going to have the exemption process.

16 That's still going to be part of the
17 process, so the exemption process will deal with this
18 issue of selective implementation. So at this point,
19 we don't consider it any longer to be a policy issue.

20 CHAIRMAN BONACA: What do you mean that in
21 some cases you would require implementation and in
22 some cases you would just exempt?

23 MS. DROUIN: What we we're talking is that
24 when you look at, let's go down into the future where
25 you have this whole set of technology neutral

1 regulations.

2 CHAIRMAN BONACA: Yes.

3 MS. DROUIN: Could you pick and choose.
4 That would mean selectively implement. And we were
5 originally saying no, you should not be allowed to do
6 that. But then, by having that, that would say, well,
7 you aren't allowing people to go through the exemption
8 process.

9 Since we, the exemption process will be
10 part of this, if people want to ask for exemption from
11 a part of it, they have the right to do that.

12 MR. ROSEN: But they have to follow all
13 the requirements in the exemption procedure?

14 MS. DROUIN: Correct, correct.

15 MR. ROSEN: And you may get it or not.

16 MS. DROUIN: They may not get it, that's
17 correct. The one thing I want to really emphasize on
18 this slide, when I say proposed, this, as I told you,
19 the SECY Paper is only right now going through
20 concurrence.

21 Once it goes through all the concurrence
22 changes before it goes up to the EDO, this schedule
23 could potentially change. I have not received
24 feedback from NRR right now, so I don't know if they
25 have completely agreed to the schedule that we

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1 proposed here.

2 So I just want to make that very clear,
3 that what could go forward ultimately may not be
4 reflected as what's on this viewgraph. But this is
5 what we have proposed in the SECY Paper and we're
6 working it through concurrence.

7 The big things is that we do want to issue
8 an early January copy of the working draft. That's on
9 target to happen, but we'd like for the Commission to
10 see it for a couple of weeks before it's released to
11 the public.

12 We do have a date scheduled for March 14th
13 and 15th, for the public workshop. We'd like to come
14 back in April to meet with the Subcommittee in detail.
15 We're prepared to come earlier if the Committee feels
16 that, you know, there's a need to come earlier.

17 We thought it might be better to wait
18 until after the workshop to come back to the
19 Subcommittee.

20 MR. APOSTOLAKIS: What's the difference
21 between issuing a working doc to the public an issuing
22 something for public comment?

23 MS. DROUIN: It's perception. We wanted to
24 make it very clear that this is all very preliminary.
25 These are not a final staff position. We're still

1 working the staff position on this.

2 MR. APOSTOLAKIS: So public comment period
3 refers to something that the staff feels is ready to
4 go, and you are soliciting public comments? Whereas
5 the other one is, look, we're still working on it, do
6 you have any ideas to help us?

7 Is that really the difference? The first
8 one is really entirely voluntary on your part. The
9 second one you cannot avoid.

10 MR. KING: Usually when you put out
11 something like a proposed rule for comment, it's the
12 staff's best shot at that time. This is work in
13 progress.

14 There's some holes in it, there's some
15 things that we're, you know, putting out as a straw
16 man to stimulate discussion. So it's a little, it's
17 not a final -

18 MR. APOSTOLAKIS: And it's not mandatory,
19 you just choose to do it?

20 MR. KING: Right.

21 MR. APOSTOLAKIS: As the other one is.

22 MS. DROUIN: Right. Because you can see
23 when we have December of 2005, that's where we want to
24 issue, what I would call more formally. Where we
25 among the staff, you know, have agreed that this is

1 our best shot. This is what our position is.

2 MR. APOSTOLAKIS: Right, I understand.

3 MS. DROUIN: But in going there, and you
4 know we have direction from the Commission to engage
5 stakeholders very early in the process and this was an
6 approach, if you remember we took with Reg Guide 1174.

7 We took the same approach with Reg Guide
8 1.200, and it was very successful bringing in the
9 stakeholders very early into the process.

10 MR. ROSEN: What happens in June, 2006?
11 You issue it, but does it become a regulation? Or how
12 is it, what -

13 MS. DROUIN: This is a frame work document.
14 This is a NUREG. This is for the staff use. And the
15 next part, I mean if you go back to that slide, the
16 next part is to develop the set of technology neutral
17 requirements.

18 And all of this is forming the technical
19 basis, ultimately, for the technology set of
20 regulations.

21 MR. KRESS: And eventually that will go
22 through rule-making.

23 MS. DROUIN: Right.

24 MR. APOSTOLAKIS: Has DOE shown any
25 interest in this?

1 MS. DROUIN: Oh, very much so. DOE has
2 contracted Idaho doing a lot of work that we hope to
3 use in this frame work document.

4 CHAIRMAN BONACA: Okay.

5 MR. APOSTOLAKIS: All right.

6 CHAIRMAN BONACA: Do we wrap it up?

7 MR. APOSTOLAKIS: We'll come to the
8 workshop anyway.

9 MS. DROUIN: We've talked about, you know,
10 we're going to have the workshop. We're going to send
11 out a Federal Register Notice that's going to have a
12 lot of, and here's just a short example.

13 I mean the actual list of topics is about
14 four or five pages. It's quite detailed what we have
15 developed that we want to go through on the workshop.

16 I hope two days is long enough for this
17 workshop. There's a lot of issues that need to be
18 discussed.

19 CHAIRMAN BONACA: If ACRS members attend,
20 it won't be long enough.

21 (Laughter.)

22 MR. ROSEN: It says attend, it doesn't say
23 participate.

24 (Laughter.)

25 MR. KRESS: Where do you expect this

1 workshop to be?

2 MS. DROUIN: Right now we do have the
3 auditorium reserved downstairs. I personally, I think
4 we're going to have a large turnout, a very large
5 turnout at this workshop.

6 MR. KRESS: Thank you, Mary and Tom.

7 MS. DROUIN: Thank you very much.

8 CHAIRMAN BONACA: All set, I think we will
9 break. Back at 11:30? Break until five after 11:00.

10 (Whereupon, the proceedings in the above-
11 entitled matter were concluded at 10:49 a.m.)

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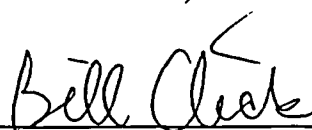
Reactor Safeguards

518TH Meeting

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