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**OFFICIAL TRANSCRIPT OF PROCEEDINGS
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS**

Title: 475th ACRS MEETING

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1 UNITED STATES OF AMERICA
2 NUCLEAR REGULATORY COMMISSION
3 ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

4 ***

5 475th MEETING

6 ***

7 Two White Flint North, Room T2-B3

8 11545 Rockville Pike

9 Rockville, MD

10 Tuesday, August 29, 2000

11 The committee met, pursuant to notice, at 8:30

12 a.m.

13 MEMBERS PRESENT:

14 DANA A. POWERS, Chairman

15 GEORGE APOSTOLAKIS, Vice-Chairman

16 MARIO V. BONACA

17 THOMAS S. KRESS

18 GRAHAM M. LEITCH

19 ROBERT L. SEALE

20 WILLIAM J. SHACK

21 JOHN D. SIEBER

22 ROBERT E. UHRIG

23 GRAHAM B. WALLIS

24

25

P R O C E E D I N G S

[8:30 a.m.]

DR. POWERS: The meeting will now come to order.

This is the first day of the 475th meeting of the Advisory Committee on Reactor Safeguards.

During today's meeting, the committee will consider the following:

Proposed risk-informed revisions to 10 CFR Part 50; causes and significance of design-basis issues; proposed final Regulatory Guide 1093 endorsing NEI 9704 document on design basis; and the AP-1000 standard plant design.

We will also be examining a variety of proposed ACRS reports.

The meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Dr. John T. Larkins is the designated Federal official for the initial portion of the meeting.

We have received no written comments from members of the public regarding today's session.

We have received a request from Mr. Bob Christie of Performance Technology, Incorporated, for time to make oral statements regarding risk-informing 10 CFR Part 50.

A transcript of portions of the meeting is being kept, and it is requested that speakers use one of the microphones, identify themselves, and speak with sufficient

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

AUGUST 29, 2000

The contents of this transcript of the proceeding of the United States Nuclear Regulatory Commission Advisory Committee on Reactor Safeguards, taken on August 29, 2000, as reported herein, is a record of the discussions recorded at the meeting held on the above date.

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

1 clarity and volume so that they can be readily heard.

2 I will call your attention to the document
3 entitled "Items of Current Interest" before you, a speech by
4 Commissioner Merrifield, and remind you of a trip report
5 from one of our staff engineers, Noel Dudley, on the same
6 conference.

7 I think that makes for interesting reading.

8 Are there any comments that members want to make
9 in the opening of the session?

10 [No response.]

11 DR. POWERS: Seeing none, I'll turn to the first
12 topic of business, which is the risk-informed revisions to
13 10 CFR Part 50, and Dr. Shack, will you take us through
14 this?

15 Oh, excuse me. I have some introductions I wanted
16 to make that I forgot to do.

17 Let's see. We have some people joining our staff
18 here.

19 First, I would like to introduce Mrs. Judith
20 Goodwin, who is coming to us from the NMSS. She's been here
21 for -- at the agency for three years, working as office
22 automation assistant, and now you're joining us in the staff
23 secretarial position.

24 Thank you very much. Welcome aboard.

25 And I'd like to introduce Undine Shoop. She's

1 joining us on a rotational assignment, and she'll be working
2 with us in a variety of positions but most notably in the
3 area of the resolution of the differing professional
4 opinion.

5 And finally, I'll mention that we have a new
6 member, Graham Leitch, who comes to us with a tremendous
7 background in the industry, vice president of operations and
8 vice president at Philadelphia Electric.

9 Welcome aboard. Hope you're enjoying the reading.

10 Excuse me, Dr. Shack. Go ahead.

11 DR. SHACK: Well, I'm just sort of collecting
12 things here.

13 We were discussing the initiatives on
14 risk-informing Part 50, and there are two major initiatives
15 we're talking about, the one for risk-informing the
16 technical requirements of 10 CFR Part 50, option 3, and then
17 risk-informing the special treatment requirements, option 2.

18 There's essentially an example case of
19 risk-informing a technical requirement involving 10 CFR
20 50.54 on combustion gas control, and I'm a little confused
21 as to how the staff is going to begin the presentations,
22 whether we're going to start with option 2 -- okay, we're
23 going to start with option 2.

24 MR. REED: I'm Tim Reed. I'll be leading the
25 presentation today on risk-informing Part 50, option 2.

1 I'll be supported with Tom Bergman. He's the lead project
2 manager on the effort.

3 Hopefully -- we have a very short period of time
4 today to get through this, so I'm going to give a high-level
5 overview of the SECY paper which we transmitted to ACRS last
6 week, and we'll have to move through these slides pretty
7 quickly just to get through them in the timeframe we have.

8 The SECY paper as transmitted to you is basically
9 a status paper, an information paper for the Commission.
10 Its purpose to exist really is to support the September 29,
11 2000, Commission briefing that we have.

12 The paper itself is really broken into two pieces,
13 if you will.

14 The first piece addresses the ANPR comments and
15 basically just gives an overview of the comments and the
16 staff's preliminary views as they exist today on those
17 comments, and then the second piece of the SECY paper goes
18 into our conceptual approach to the rulemaking as it stands
19 today.

20 Going to the first part, then, the overview of the
21 NPR comments and our preliminary views, in general we
22 received, I guess, 11 comment letters, I believe it was, and
23 that comprised over 200-plus comments.

24 The comments, in general, were supportive of
25 risk-informing Part 50, risk-informing the special treatment

1 requirements.

2 In the SECY proper, in the body of the SECY, we
3 actually go into some detail on eight issues we discuss in
4 there, and in the attachment to the SECY, you'll see eight
5 tables that basically take all the comments and categorize
6 them into the tables, and you can see issues there with
7 preliminary responses.

8 So, a lot more detail in the attachment, some
9 issues up in the SECY paper.

10 This is all preliminary in the SECY, and
11 everything we say today, of course, is preliminary.

12 The final responses to these ANPR comments will go
13 with the proposed rule.

14 Okay.

15 Going to the -- some of the highlights on the
16 issues that we discussed in the SECY paper, I'll touch upon
17 a few of these.

18 Selective implementation was an issue that we got
19 stakeholder comment on, and basically the comment was to --
20 suggested that there be full selectivity in 50, option 2, in
21 50.69, basically, to implement it for any of the special
22 treatment rules and for any parts of the plan in terms of
23 the systems, structures, and components.

24 On the first part, on what I'll call the rule
25 selectivity, the staff agrees, as we stand today, we do

1 agree. We do also acknowledge that, in fact, there may be
2 bundles of rules that you'd have to implement, because we
3 want to do this without exemption, so -- but in general, we
4 agree. We should be free to implement it for whatever set
5 of rules licensees want to implement it for.

6 On the second part of it, the systems side of it,
7 we'd like to see all the -- really, this boils down to the
8 RISC-2 SSCs. Those would be the non-safety-related,
9 safety-significant SSCs identified. So, we'd like to see
10 all those identified.

11 We recognize that licensees are motivated to
12 certainly look at the unnecessary burden reduction.

13 So, they'll definitely, I think, look at
14 identifying all the RISC-3 ones. We want to see all the
15 RISC-2 SSCs identified.

16 The second bullet here goes to discussing impact
17 on other regulations, and the comments, in fact, reflected
18 that they thought the staff did, in fact, identify the other
19 regulations where there was some impact.

20 I simply note here that probably the biggest one
21 is Part 54, the most important one.

22 We need to make sure that that is risk-informed as
23 part of this option 2 approach.

24 We got some comments on the need for prior NRC
25 review, and this really goes to how we structure the

1 framework.

2 These were mixed comments. Some of the comments
3 suggested, in fact, that there should be some prior review;
4 others suggested no prior review; some suggested no prior
5 review, no detail in the regulation.

6 In fact, where we're going today is where we have
7 been going, towards a minimal or no prior review regulatory
8 structure, which tends to force more detail and requirements
9 into the rule and more of a robust categorization process.

10 We're still heading there, but we certainly aren't
11 locked in.

12 We'll consider other approaches which have more
13 flexibility and less detail.

14 So, that's where we stand on that.

15 George?

16 DR. APOSTOLAKIS: When you say prior review,
17 review of what?

18 MR. REED: Prior review would be some submittal,
19 like a submittal to implement 50.69. It would probably
20 involve, I think, to some extent, something on the --
21 probably in the PRA space.

22 DR. APOSTOLAKIS: So, it would include the review
23 of the PRA?

24 MR. REED: To some extent.

25 MR. BERGMAN: It could. You could do it on just

1 prior review and approval of categorization, prior review
2 and approval of treatment, or prior review and approval of
3 both.

4 MR. REED: Yeah. We're trying to avoid prior
5 review and approval of either categorization or treatment.

6 DR. APOSTOLAKIS: That would presume that you
7 trust the PRA.

8 MR. REED: You would have to, I think, to support
9 the no prior review, and that's part of the problem. We
10 recognize there's definitely difficulty with this, and I
11 think you guys are fully aware of the issues on PRA, and I'm
12 sure that's where your question is coming from. We
13 recognize that, and like I said, it's our objective to
14 strive towards minimal review, but in fact, you know, we
15 have to recognize where PRA stands.

16 DR. APOSTOLAKIS: Now, the second bullet -- would
17 you tell me again what -- review Part 54? That's the
18 license renewal, right?

19 MR. REED: Yes, that's license renewal.

20 DR. APOSTOLAKIS: Should be risk-informed. And
21 the staff agreed with that? Or is that just a comment you
22 got?

23 MR. REED: That's our preliminary position.

24 MR. BERGMAN: In other words, we want licensees to
25 be able to do option 2 and then go into license renewal

1 without going back and redoing the whole scope as written in
2 the current Part 54.

3 DR. SHACK: It's only the scope that he's talking
4 about.

5 MR. BERGMAN: It's the scope of it that would be
6 affected.

7 MR. REED: We wanted to be seamless, in other
8 words that you transition into license renewal, that there's
9 not a big perturbation, that you don't somehow revert to a
10 pre-option 2 scope. We don't want to have that kind of
11 perturbation.

12 DR. SHACK: I don't see that that will require a
13 rule change, will it? Because that will become part of your
14 current licensing basis which you will carry into --

15 MR. REED: Actually, there's mixed views on it.
16 It could involve a scope change. I think it's the 54.4, and
17 in fact, there's some views that you could probably do it
18 with the current Part 54.

19 We're not -- you know, we haven't nailed that down
20 yet.

21 DR. SHACK: Okay.

22 MR. BERGMAN: We would have to show that the
23 treatment applied to RISC-3 was sufficient to address the
24 aging management concerns that's currently provided under
25 the scope by the maintenance rule, because under option 2,

1 RISC-3 equipment is out of scope of the maintenance rule
2 now, but all that equipment would still be -- still meets
3 the scoping provision in Part 54.

4 So, we have to say what provides that assurance
5 under Part 54.

6 DR. APOSTOLAKIS: I can't see how your objective
7 can be no prior review. I mean there is no way. You'll
8 have to review something.

9 I mean even if we were not aware of what's
10 happening with the ASME standard, still, wouldn't you want
11 to know how the expert panel made its decisions?

12 MR. BERGMAN: But you can do that through
13 post-implementation.

14 MR. REED: We'll learn some things from the pilot
15 plants, and that will also drive some of this issue, too,
16 you know, how predictable this categorization process is,
17 how repeatable, if you will, and if it's scattered, if the
18 pilots, in fact, owners group pilots get a lot of different
19 answers and a lot of scatter in the results, then I think
20 it's going to force us more into review.

21 DR. APOSTOLAKIS: So, the key is the word "prior,"
22 not "review."

23 MR. REED: Yeah, that's right.

24 DR. APOSTOLAKIS: Okay.

25 MR. REED: The last issue, then, since we're

1 already starting to hit upon it, is PRA quality. That's a
2 big deal, of course.

3 In our NPR that went out, we actually, in the
4 Appendix T piece of it, we said that you had to apply or
5 conform to the ASME ANS standard.

6 What we're indicating here is we will certainly
7 accept other methods.

8 In fact, we are currently reviewing the NEI peer
9 certification as another method.

10 So, we're flexible. That's all this is saying.
11 We're not going to lock into a standard.

12 As you're well aware, we are, in fact, reviewing
13 the standard, also.

14 I will also just add a comment. I think it's
15 obvious, but I suggest the ACRS read the SECY in detail.
16 This is really very high-level, and you'll get a lot more
17 information out of the SECY than provided here.

18 Some additional highlights here:

19 We got some comments on the overall approach to
20 implementing this rulemaking, suggesting different phases,
21 different pieces of the special treatment requirements in
22 different phases, and currently we believe that -- we still
23 believe that we can do this in one rulemaking, putting aside
24 50.36, and we did agree with the comments on 50.36. That's
25 the tech spec rule.

1 Other than that, we think we can do the rest of it
2 in a single rulemaking, probably still looks like the most
3 efficient way.

4 50.36, though -- that's a separate effort, and
5 that would probably be more of a configuration risk
6 management effort, along with 50.65. That should probably
7 be done separate.

8 An important piece to this, by the way, is the
9 next two bullets, Part 21.

10 From the industry's perspective, there's a lot of
11 potential unnecessary burden reduction there, and so, in
12 this regard, we do agree with the comments that it's
13 probably true that RISC-3 SSCs wouldn't trip or wouldn't
14 exceed the notification requirements in Part 21 in terms of
15 they wouldn't create a substantial safety hazard and they
16 wouldn't exceed the tech spec safety limit, or defect or
17 deviation in one of those components, if you will, under
18 Part 20 wouldn't, in fact, cause those notification
19 requirements to be exceeded, but in fact, we still think the
20 best way to proceed here is to take RISC-33 SSCs out of the
21 scope of Part 21 and make it absolutely clear, consistent
22 with the way we're doing the other special treatment
23 requirements, to remove them from the scope of the special
24 treatment requirements, whatever it is.

25 So, that's the way we, right now, are going to

1 proceed on that.

2 We also agree with the comments that Part 21
3 should not apply to the non-safety-related piece. That's
4 the RISC-2. These aren't basic components. They weren't
5 Appendix B-designed and manufactured. We agree.

6 But we also recognize that these are, in fact,
7 safety significant components, and functional failures of
8 safety significant components is generally something that
9 the NRC is interested in.

10 So, we'll be looking at that. We'll be looking at
11 what our current reporting requirements are, 50.72, 73,
12 whether that, in fact, captures it, whether there's industry
13 reporting like EPICS that might capture it, and if that
14 captures it, fine.

15 If not, then we'd consider whether, in fact, in
16 50.69, we had to have some sort of reporting.

17 That's all I wanted to hit on as far as the
18 high-level view of the ANPR comments, and then I'll just go
19 to the --

20 DR. SHACK: Tim, just a question.

21 There's not a whole lot out on the treatment that
22 you're going to require for the RISC-3 components, which is
23 an interesting topic.

24 Is this review guidelines you have for the STP
25 exemption request -- is that treatment about as detailed and

1 complete as there is, or is it hidden somewhere else?

2 MR. REED: That's the most detailed that we have.

3 DR. SHACK: And what is the status of this thing?

4 I mean it's just sort of appended to the document I got. Is
5 it draft?

6 MR. BERGMAN: Yeah, those are draft, and we'll
7 continue to work on them.

8 I mean right now, that level of detail is more
9 likely to be in a regulatory guidance document than anything
10 else, but the actual role they'll play in the rulemaking has
11 not been decided.

12 But they were provided to South Texas to aid them
13 in development of their revised exemption request in terms
14 of the information we needed to draft our SER for that
15 exemption.

16 DR. SHACK: Okay. So, then we could sort of look
17 at this as like a first draft of a reg guide on treatment
18 requirements?

19 MR. BERGMAN: Potentially, yes.

20 MR. REED: Certainly a work in progress, though.

21 DR. APOSTOLAKIS: The truth is that we still don't
22 know what the impact on CDF and LERF is from all these
23 changes.

24 MR. BERGMAN: That's correct.

25 DR. APOSTOLAKIS: And whether I have one SSC in a

1 particular category or 1,100, the system is insensitive to
2 that fact. The whole scheme is insensitive, and they will
3 each be treated as individuals, as belonging to that group.
4 Is that correct?

5 MR. BERGMAN: I think they look at it in a group.
6 Maybe Mike can come up and bail us out here.

7 DR. APOSTOLAKIS: Do I know what you're going to
8 say, Mike?

9 MR. CHEOK: I think so.

10 What we do, George, is that we do ask them to do a
11 sensitivity study where they do increase the failure
12 probabilities as a group of all the LSSCs so that, I guess,
13 we do get a group effect.

14 DR. APOSTOLAKIS: This is a little risky, because
15 you may end up with a delta CDF that's higher than allowed.
16 So, you have to go back and then argue that the sensitivity
17 study was unrealistic.

18 MR. CHEOK: South Texas is using a factor of 10.
19 We are proposing a factor of 3 to 5, but you're right, it
20 could be risky.

21 DR. APOSTOLAKIS: Factor of 3 --

22 MR. CHEOK: -- for each one, yeah, and do it as a
23 group.

24 DR. APOSTOLAKIS: But you can find Fussell Veseley
25 and so on for a group, can't you?

1 MR. CHEOK: You can for the Fussell Veseley, not
2 for the risk achievement.

3 DR. APOSTOLAKIS: Right.

4 MR. REED: All set, George?

5 DR. POWERS: In light of the material that Dr.
6 Bonaca prepared for us on the experiences and some of the
7 Swiss work on risk-informing regulations and using risk
8 metrics, is it clear that delta CDF is the proper metric to
9 use for these things?

10 The Swiss, I think, found that they would get very
11 modest -- and Dr. Bonaca, please feel free to correct me
12 here -- found that they would get relatively modest changes
13 in both CDF and LERF, but when they looked at the actual
14 magnitude of the release times its frequency, they would get
15 rather substantial changes, and that raises a question in
16 your mind on whether delta CDF and delta LERF are really the
17 right metrics to use.

18 DR. APOSTOLAKIS: Are you aware of that?

19 MR. CHEOK: I guess I'm not aware of the study.

20 In our process, what we do is that we like for the
21 expert panel to bring in the consequences and the
22 containment issues as part of the integrated decision-making
23 panel, as opposed to as part of the PRA.

24 DR. POWERS: That means that you're going to have
25 to have expertise on the panel dealing with radio-nuclide

1 release and transport?

2 MR. CHEOK: Right now there's no such specific
3 requirement.

4 DR. POWERS: Then how can they answer the
5 question?

6 MR. CHEOK: I guess it's something we need to
7 think about.

8 DR. SEALE: I think we've, in the past, been told
9 by people from industry, including INPO, that in the more
10 detailed assessments that they've been using, they have come
11 to rely on other measures of success or failure besides core
12 damage frequency or whatever -- that is, things which
13 anticipate more serious problems like core damage and things
14 like that -- and it strikes me that, at least at the very
15 minimum, it would be nice if the staff knew what these were,
16 and I don't think we're really comfortable in knowing
17 exactly what these other success criteria are. I think it's
18 unfortunate.

19 DR. POWERS: I think we keep looking for
20 surrogates --

21 DR. SEALE: Yeah.

22 DR. POWERS: -- for what we're really interested
23 in, because we know what we're really interested in is
24 really complicated to calculate, and I worry that we don't
25 have somebody checking to see if our surrogates are useful

1 surrogates and where the bounds of applicability are.

2 What we're really interested in is the actual
3 risk, and that has a product component, and we keep looking
4 for surrogates for one element of the product.

5 DR. SEALE: What the utilities have done is -- I
6 mean if we really understand -- or if I understand it -- I
7 won't say about the rest of you, but if I understand what
8 they've done, they've probably gone a far way toward
9 identifying some of these surrogates, and we ought to know
10 more about it.

11 DR. POWERS: Yeah.

12 DR. APOSTOLAKIS: I'm not sure that the word
13 "surrogates" is the right one.

14 DR. POWERS: To quote a sage colleague of mine, it
15 was not the product of deep thought.

16 DR. APOSTOLAKIS: The point I wanted to make --
17 one has to be careful when one opens his mouth.

18 [Laughter.]

19 DR. APOSTOLAKIS: I wanted to point out -- it's a
20 new thought -- that after the reactor revised oversight
21 process, we have objectives that are cornerstones that
22 really are way before the actual risk, and you know, CDF and
23 LERF are convenient numerical measures, but I'm sure in the
24 integrated decision-making process, protecting the integrity
25 of the primary system, for example, is a consideration, so

1 that we are not just talking about surrogates, but other
2 than that, I agree.

3 DR. SEALE: Well, it was in the context of the
4 evaluation process --

5 DR. APOSTOLAKIS: Yeah.

6 DR. SEALE: -- that these other measures came up,
7 at least in one case.

8 DR. WALLIS: I'd like to pursue this a bit more.

9 On this IDP, it's stated that sufficient safety
10 margin should be maintained.

11 Now, how do we know what sufficient safety margin
12 means?

13 MR. CHEOK: I think what we said in the IDP was
14 sufficient safety margin should be maintained commensurate
15 with the uncertainty in the engineering analyses.

16 DR. WALLIS: How do we know what that means? We
17 know that uncertainty has some influence on margin, but the
18 whole concept of margin seems to be a very vague one.

19 DR. SEALE: And the engineering analysis of what?
20 CDF?

21 MR. CHEOK: It could be the probabilistic part of
22 it, which is CDF and LERF, or the parts of the PRA which are
23 uncertain.

24 DR. WALLIS: How does this panel decide that
25 safety margins are sufficient?

1 DR. APOSTOLAKIS: I guess they compare with the
2 existing ones.

3 [Laughter.]

4 DR. POWERS: I think this is his point.

5 MR. CHEOK: Perhaps I can give an example.

6 I mean I guess we will see this more in our pilot
7 studies, which we should have coming up, but in previous
8 studies, when we are doing in-service testing, again, in
9 that case, we do one in a lambda-T by two model.

10 We were saying that, since we may not have that
11 much of certainly in this lambda-T by two model, we could
12 make sure that the lambda is -- we have margins in your
13 lambda by saying that -- let's do a better test whereby we
14 can try to trend your failure rates over time so that we
15 will know that we have a more constant lambda with the aging
16 process.

17 So, in that sense, it's saying, look, let's try to
18 be more certain with our model by trying to predict a better
19 failure rate using a better test method.

20 DR. WALLIS: But does this mean that's sort of an
21 ad hoc process, that every time you come up to a question,
22 you use some -- what you think is a measure of safety margin
23 for that particular question, or is there some more general
24 guideline about what safety margin means?

25 MR. CHEOK: I am not sure if it's an add-on

1 process, but it's a process that we --

2 DR. WALLIS: Ad hoc.

3 MR. CHEOK: Ad hoc. Okay. I'm sorry.

4 It could be ad hoc in the fact that we will have
5 to see how the different parameters are being affected and
6 what we need to be more certain about and where we need to
7 be more certain of where the margins are.

8 DR. WALLIS: Well, this whole topic is
9 risk-informed, isn't it?

10 So, you've got to say something about what safety
11 margin means in the context of risk, haven't you?

12 Here's a chance to be quantitative about something
13 which has been vague for too long.

14 I seem to have the floor. Has anyone got a reply?

15 MR. BERGMAN: We're going to have to actually
16 consider it, obviously, going forward, but if we're going to
17 say we need to quantify these now, I think you would not
18 want to -- you would want to limit your quantification on
19 the risk end of it, rather than do something that hasn't
20 been done to date.

21 I mean there would be no point in making them
22 replicate the safety margin for the whole -- the existing
23 analysis. I think you just want to look forward at that
24 point.

25 DR. WALLIS: Would you agree that there is a

1 problem, though, with the vagueness about which you mean by
2 safety margin and perhaps it should be cleared up by tying
3 it in in some way with risk-informed, which is the umbrella
4 that's supposed to describe the process you're going
5 through?

6 MR. BERGMAN: I think we need to look at
7 increasing the specificity there.

8 MR. CHEOK: In option 3, we are trying to define
9 better what safety margins is with respect to risk and also
10 defense-in-depth, and I think we might discuss that a little
11 more later on.

12 DR. SHACK: We'd better move on.

13 MR. REED: Yes. I think we're already out of our
14 time here.

15 So, let me get to the second piece of the
16 presentation, which is also the second part of the SECY, and
17 that goes to the conceptual approach for the rulemaking, as
18 we understand it today.

19 This slide just simply notes that we're still on
20 the same path we were with SECY 99-256. It involves a --
21 relies on a robust categorization, which, of course,
22 increases the certainty.

23 If you, in fact, bin these things appropriately
24 according to their safety significance, we would expect
25 licensees to be required to maintain functional capability

1 of SSCs using either existing or new programs.

2 For the RISC-2 piece, we would expect the
3 licensees would be required to control the reliability,
4 availability, and capability of these SSCs per the
5 assumptions in the categorization process.

6 For the RISC-3 piece, they would be required to
7 maintain their design functions, as described in the UFSAR,
8 and in fact, there would be an additional requirement that
9 would describe in your updated FSAR how, in fact, you meet
10 these requirements to maintain functional capability of the
11 RISC-2 and RISC-3 SSCs.

12 I might also mention that there would also be a
13 requirement to take corrective action if, in fact, you found
14 the SSC wasn't functionally capable.

15 That's a necessary thing, since they will now be
16 removed from Appendix B. So, we'll have a corrective action
17 statement in there, also.

18 That's the way we see it conceptually right now,
19 and that's also discussed in the SECY paper.

20 DR. APOSTOLAKIS: Now, this whole approach seems
21 to rely heavily on importance measures, and we had a
22 presentation here from Consumer's Energy that follows a
23 different approach, the top-event prevention methodology,
24 which is a success-oriented methodology.

25 I wonder whether you're telling these people to

1 abandon that approach and switch back to Veseley and
2 risk-achievement work or there is room here for another
3 approach?

4 MR. CHEOK: There is room here for another
5 approach. As a matter of fact, we did talk to Consumer's
6 Power about the top-event prevention, and I think the
7 methodology would allow for such an approach.

8 I think Consumer's Power also talked to NEI about
9 adopting this thing as part of the industry approach, and I
10 think the feeling there was that there's not enough people
11 that are doing the TEP for them to formalize the procedure
12 but that Consumer's Power is more than welcome to submit a
13 application using TEP and we would be glad to review it.

14 DR. APOSTOLAKIS: Well, the problem, though, I see
15 is that -- this is going to be in Appendix T?

16 MR. CHEOK: Appendix T does not specifically
17 mention the top-event prevention --

18 DR. APOSTOLAKIS: I know.

19 MR. CHEOK: -- but I guess Fussell Veseley and
20 risk achievement were mentioned.

21 DR. APOSTOLAKIS: So, this is part of the rule.

22 So, if those guys come up with something else,
23 then would it take a change in the rule to accommodate them?

24 MR. CHEOK: I guess at this point we are not quite
25 sure if this will be part of the rule or part of the reg

1 guide, and I guess industry's comment is that, if it's part
2 of the reg guide, it would make it a lot more flexible, so
3 that more people -- and that's one of the comments that's
4 made, that if we have less prescription, perhaps then it
5 will allow for more flexible implementation of the rule.

6 DR. APOSTOLAKIS: I mean, using the TEP, I'm not
7 even sure you can have categories like RISC-1, 2, 3. At
8 least in the papers I have seen from those guys, they didn't
9 categorize.

10 MR. CHEOK: I think in using TEP you would define
11 your horizontal line, what's safety significant and what you
12 don't take credit for, thereby it becomes less safety
13 significant.

14 So, that defines your horizontal line. The
15 vertical line is still being defined by whether something is
16 safety-related or not safety-related.

17 DR. APOSTOLAKIS: So, the ones that would be
18 members of the top-event prevention set -- those would have
19 the full treatment, I suppose, corresponding to RISC-1.

20 MR. CHEOK: Right, RISC-1 or RISC-2.

21 DR. APOSTOLAKIS: And then others will have
22 something else.

23 MR. CHEOK: That's correct.

24 DR. APOSTOLAKIS: The other thing is I'm not sure
25 I subscribe to the idea that not enough people are doing it,

1 therefore it's not going to be included. The methodology
2 should be evaluated on its merits.

3 DR. SHACK: No, he said the industry felt it
4 wasn't worth their while to develop it.

5 DR. APOSTOLAKIS: I know, and I'm disagreeing with
6 the industry.

7 Just because the other measures have been around
8 longer, that doesn't make them better.

9 I mean why can't you include something in here to
10 allow for a TEP approach or say something that opens the
11 way?

12 In fact, I do think, myself, that this should be a
13 regulatory guide, rather than appendix to the rule, would
14 have more flexibility, but there ought to be some mention of
15 it somewhere.

16 Is that illegal do or what?

17 MR. BERGMAN: No, and that's part of the push for
18 a -- do as much as you can through regulatory guides, but
19 the advantage to prior review and approval there is it's
20 basically you must use an approved method, and one method
21 could be underdevelopment, another one that would have to be
22 submitted is different.

23 You just can issue a series of reg guides
24 approving different methods, or individual plant submittals.
25 I mean you can do it on a plant-by-plant basis. You can do

1 it on a topical basis.

2 There is flexibility there.

3 DR. APOSTOLAKIS: So, what you're saying is that
4 there may be a regulatory guide with this approach, and then
5 if you finally convince yourselves that the other approach
6 is okay, then you will issue a new regulatory guide or
7 revise the existing one?

8 MR. BERGMAN: You can do either. If you pack too
9 many methods in one reg guide, it just becomes an unwieldy
10 document.

11 DR. APOSTOLAKIS: Well, the only thing I would
12 like to see here, I think it would be helpful, is some sort
13 of a statement somewhere that this is a way that right now
14 is relatively mature for doing these things, but you know,
15 we may see others like the TEP in the future.

16 MR. CHEOK: Or we can write the reg guide to be
17 general enough so that it will accommodate the TEP and any
18 kinds of importance measures.

19 DR. APOSTOLAKIS: Yeah, whatever, but as long as
20 it doesn't create a precedent that this is it.

21 DR. POWERS: I have a question.

22 If you write a reg guide that is sufficiently
23 general to encompass a risk metric and a TEP event, is this
24 such a general guide that it's no guide at all?

25 MR. CHEOK: We have that problem. I guess we have

1 a problem with the PRA standards. We do have the problem
2 with a lot of things, how much prescription is enough and
3 how much is too much.

4 DR. APOSTOLAKIS: You can mention some and then
5 focus on this one.

6 There's nothing wrong with that.

7 DR. SHACK: Your real conflict comes in with your
8 no prior review.

9 MR. BERGMAN: If we're going to require prior
10 review and approval, we can be very flexible, because you're
11 going to review each application on its own merits. It just
12 becomes -- it's difficult to create a lot of flexibility in
13 a rule and yet not have any sort of review mechanism over
14 what's being done, unless you have very clear performance
15 measures or something that you can tack on, but we're not
16 there yet, I don't think.

17 DR. APOSTOLAKIS: Have you decided what to do with
18 this?

19 Is this going to be an appendix or is it going to
20 be a regulatory guide?

21 MR. BERGMAN: We have not. That decision isn't
22 final. I mean that will be part of our work through the
23 proposed rule.

24 Next August, we'll have to have made a
25 recommendation, because we're going out with the proposed

1 rule.

2 At that time, we'll know, and we should know
3 sometime ahead of that, of course, but ultimately, we have
4 to recommend one approach.

5 DR. POWERS: We'd better move on.

6 MR. REED: Okay.

7 Just two more slides.

8 I'd just point out what's going on.

9 There's a lot of work going on right now, ongoing
10 tasks.

11 We're working with NEI, reviewing their
12 implementing guidance.

13 There's a certain amount of effort going on right
14 now reviewing the STP exemption request, and in fact, many
15 of these issues that we're discussing today will have to be
16 hammered out on South Texas.

17 There's an effort on in-house looking at
18 commercial processes that will support this entire
19 framework, and of course, we're interacting with
20 stakeholders.

21 We have a meeting with NEI coming up in the middle
22 of September right now, September 13th that's scheduled for,
23 and then the Commission briefing, as I've already mentioned,
24 on September 29th.

25 Just to summarize, then, our overview here, the

1 APR comments were, in general, supportive of our effort to
2 risk-inform the special treatment requirements.

3 We continue with an approach that's consistent
4 with SECY 99-256.

5 The STP exemption review continues, and then we're
6 continuing to interact and hopefully resolve many of these
7 issues we're talking about today.

8 That's all I have.

9 DR. APOSTOLAKIS: So, here you're dealing with
10 actual systems, structures, and components, right, that I
11 can go and touch.

12 You're not dealing with events -- human error, for
13 example. That can belong anywhere.

14 MR. BERGMAN: Right. We're really talking
15 equipment performance in option 2.

16 DR. APOSTOLAKIS: And you are not talking about
17 frequencies of initiating events, are you?

18 MR. BERGMAN: I think, conceptually, you could say
19 you are if you believe that the equipment performance was
20 going to affect the new equipment.

21 DR. APOSTOLAKIS: I mean you can find the Fussell
22 Veseley for initiating event, but you cannot find the role
23 for initiating event.

24 So, initiating events are out, also.

25 MR. REED: In general, when we talk about changes

1 in initiating event frequency, we're making an assumption
2 that, when we change the treatment, in fact, the performance
3 of the equipment will change, you know, lead to greater
4 initiating event frequencies.

5 That remains to be seen.

6 There certainly isn't data that would indicate
7 that today.

8 DR. APOSTOLAKIS: Is that true, Mike? What's left
9 out?

10 This is just hardware?

11 MR. CHEOK: I guess I wasn't listening to the
12 question. I'm sorry

13 DR. APOSTOLAKIS: When we categorize SSCs, we mean
14 actual SSCs that one can touch. We're not talking about
15 events like human error and we're not talking about
16 initiating events.

17 MR. CHEOK: In a sense, when you do the
18 categorization using the PRA, you are categorizing based on
19 the basic events.

20 So, if the HEP is a basic event in the PRA or the
21 initiating event is a basic event, that gets ranked with the
22 rest of the list of components, but what you do with these
23 events would be up to the analyst.

24 You might have to break this initiating event up
25 to, if it's a support system event, what causes this

1 initiating event and how important is this support system to
2 this initiating event?

3 DR. APOSTOLAKIS: So, you would take the human
4 error and see what component it affects --

5 MR. CHEOK: That's correct.

6 DR. APOSTOLAKIS: -- and that would affect the
7 special treatment of the component.

8 MR. CHEOK: That's correct.

9 DR. APOSTOLAKIS: Now, how about initiating
10 events?

11 MR. CHEOK: Like I said before, if it's a support
12 system initiating event, then you might have to -- a lot of
13 -- actually, a lot of IPEs or PRAs actually have fault trees
14 to describe these initiating events if it's a support system
15 initiating event, and you can break it down and see what the
16 importances of the different components are to this
17 initiating event frequency.

18 DR. APOSTOLAKIS: So, it comes down to hardware.

19 MR. BERGMAN: If I could, I think we might be able
20 to provide a partial answer to Dr. Wallis' question.

21 In terms of the deterministic analyses, I don't
22 think we expect the safety margins to change under option 2,
23 because we're not changing the design of the facility. So,
24 from that standpoint, the safety margin should remain the
25 same.

1 DR. WALLIS: Why did you keep writing down,
2 though, that this IDP should ensure that there is sufficient
3 safety margin to demonstrate --

4 MR. BERGMAN: That's why I think we need to look
5 at that, but it would be from a risk-informed standpoint.

6 If we're going to say that the safety margin is
7 going to change deterministically, there needs to have been
8 a design change that went along with that, which would still
9 be evaluated under the current design change processes for
10 option 2.

11 DR. WALLIS: I guess I'm also, though, asking you
12 what the measure of safety margin is.

13 Saying it hasn't changed, you don't think it's
14 changed, is, again, a sort of vague thing unless you have a
15 measure of what it is.

16 MR. BERGMAN: Well, it's determined by the same
17 approach as it is today, through design factors.

18 DR. WALLIS: I know, but I mean it's always talked
19 around.

20 But no one can explain to me how I measure when
21 I've got it and what it is.

22 MR. BERGMAN: I don't think there is a direct
23 measure of it today.

24 DR. WALLIS: I think my theme is going to be that
25 you should not use the words "safety margin" because no one

1 knows what it is.

2 It's a convenient thing to reassure people, but if
3 it doesn't mean anything, don't use the term.

4 DR. APOSTOLAKIS: Isn't it true that the PRA --
5 maybe the experts here can answer -- has quantified
6 defense-in-depth expressed by redundancy and diversity but
7 has not quantified safety margins?

8 Is that true or not?

9 In a PRA, we do not include the probability that a
10 failure point -- that a stress will be greater than the
11 strength.

12 I think that's a true statement, Mary?

13 MS. DROUIN: If you say so.

14 [Laughter.]

15 DR. APOSTOLAKIS: No, really, I mean we take all
16 the redundancies, right, one out of two, two out of three,
17 we quantify those, because that's the easy part, but when it
18 comes to the safety margins, except in rare cases -- I think
19 in the containment analysis, people do that, where you have
20 the spikes in pressure and you have the design pressure and
21 so on, but routinely we don't do it, and I think that's
22 related to Professor Wallis' question, and maybe that will
23 be the next generation of PRA.

24 But we don't do it, and when you say, you know,
25 preserve the safety margins, I agree, it's just, you know,

1 look at what you have now and make sure you don't deviate
2 too much, but you have not quantified it.

3 I mean if your failure point -- or if you take now
4 this design point 10, then maybe the change will take you to
5 9 but not to 6, because that's a big change.

6 Now, how big is it? We don't know. I think
7 that's the logic, right?

8 MR. BERGMAN: Yeah.

9 DR. APOSTOLAKIS: Stay close to where you already
10 are.

11 MR. BERGMAN: You can't show that there's a
12 change.

13 DR. POWERS: Okay.

14 We're going to have to move on.

15 DR. SHACK: Which piece are we going to do next?
16 Option 3 or 50.54 or 50.44?

17 MS. DROUIN: It's one and the same.

18 DR. SHACK: Okay, one and the same.

19 MR. KING: For the record, I'm Tom King from the
20 Office of Research.

21 With me is Mary Drouin, also from the Office of
22 Research.

23 What we're going to talk about today is focus on
24 the changes to 50.44, the combustible gas regulation, which
25 is really the first recommended risk-informed alternative

1 coming out of option 3, and as we go through it we can talk
2 about how we got to these recommendations, which really
3 applies what we had called the framework document, which
4 sort of lays out how the staff is approaching looking at the
5 reactor regulations and making decisions on should there be
6 a risk-informed alternative and, if so, what should that be,
7 but we're not going to walk through the whole framework.
8 We're just going to use 50.44 as sort of a way to illustrate
9 how we've approached this.

10 I think you have a package -- we had sent you a
11 copy of the draft SECY paper framework and 50.44 package --
12 I'm not sure -- sometime in the past couple of weeks. We do
13 owe this package to the Commission. It's due to the EDO
14 this week, the Commission next week.

15 It would be nice to have a letter from the
16 committee on the package, if the committee is so inclined to
17 write such a letter.

18 So, we can come back and talk about that at the
19 end, but with that, I'm going to let Mary walk through this.

20 DR. SHACK: Since you're not going to talk about
21 the framework directly, I'm interested in one of the --
22 essentially the issues in the Commission paper, which was
23 the use of the safety goals, and there seemed to me a
24 dichotomy in the way it was treated in the Commission paper
25 and in the framework document.

1 In the framework document, I thought you were
2 arguing that you were using the safety goals because those
3 are the safety goals and those seemed the logical thing to
4 design the regulatory system to.

5 In the Commission paper, there's more a -- you
6 know, in theory, one could develop and apply a more generous
7 regulatory framework, one that eliminates the elimination of
8 all measures not needed for adequate protection, and then
9 you argue that you don't do that because of PRA limitations
10 and uncertainties, and that's an argument that doesn't
11 appear anywhere in the framework document.

12 MR. KING: Yeah. It was put in the SECY paper
13 more to explain to the Commission why we chose the safety
14 goal level of safety to risk-inform to.

15 The framework document is more here's guidance to
16 the staff without some of the rationale.

17 DR. SHACK: Okay. So, that really is your
18 argument, then, for going to the safety goal.

19 MR. KING: Well, it's part of the explanation.
20 Those words came from Reg. Guide 1.174, which we use the
21 safety goal to develop the metrics and the CDFs and LERFs
22 and so forth in there.

23 We thought the philosophy that was used there
24 really applies here, as well.

25 Maybe I ought to mention there's two changes that

1 were made to the SECY paper.

2 I think the version you have has four policy
3 issues in it.

4 The version that's on its way to the EDO's office,
5 in concurrence -- that's been reduced to two policy issues.
6 The two policy issues that are in there are selective
7 implementation and back-fit.

8 The one that we called safety goals, we've sort of
9 reached the conclusion that that really isn't a policy issue
10 anymore, because the Commission decided that back when we
11 were doing 1.174.

12 We used the safety goal to define the level of
13 safety we're trying to achieve, and we build our metrics
14 based upon the QHOs and the subsidiary objectives from the
15 safety goal.

16 So, we don't call that a policy issue anymore in
17 the SECY paper.

18 The other one that we are not calling a policy
19 issue is the definition of defense-in-depth.

20 I think what we want to do is point out to the
21 Commission what we're using, but we're not really calling it
22 a policy issue at this point.

23 DR. APOSTOLAKIS: I think one of the main reasons
24 that you are not using figures that represent adequate
25 protection is that you don't have them, and I don't know why

1 we don't say that.

2 DR. KRESS: I don't think that's true, George. I
3 think if they had them, they would not use them. They would
4 use the safety goals.

5 MR. KING: I think that's true, too.

6 DR. APOSTOLAKIS: Then why don't we say these
7 things?

8 What I'm saying is that we can really say, given a
9 certain situation, that there is inadequate protection if
10 something is exceeded.

11 In fact, you can have a core damage frequency that
12 is within the goal, and I can see a situation where you guys
13 will say no, you also have to do this, because we don't like
14 the margin you have here or we don't like the redundancy you
15 have there.

16 So, as you've said, you and your colleagues have
17 told us many, many times, adequate protection is something
18 that you decide after you go through a process that looks at
19 many, many things.

20 Now, I think that's a reasonable argument, and I
21 would rather see that here and then go naturally to the use
22 of the safety goals rather than say that we would -- one
23 would apply a more generous framework that permits the
24 elimination and so on.

25 DR. SHACK: It's apparently gone. That's one way

1 to solve the problem.

2 DR. APOSTOLAKIS: I think that's a good
3 opportunity, since, you know, the agency has been criticized
4 from outside bodies that it doesn't have a definition of
5 adequate protection and so on.

6 This would be an excellent opportunity to say a
7 few things about it, don't you think, and put it on solid
8 ground, because when I read this, it left me a little cold.
9 I mean it didn't really say anything.

10 It just said that we could be more generous, but
11 we decided not to be, and I think there are more fundamental
12 reasons for doing it this way. It's not just a matter of
13 being generous.

14 MR. KING: You could say more, I agree. We could
15 say more, but we don't have to in this paper, because we
16 don't have to define adequate protection to proceed with
17 option 3.

18 DR. APOSTOLAKIS: No. And that's what you should
19 say, that -- again, coming back to what you have told us
20 many times, that adequate protection is just -- it's not
21 just a number.

22 MR. KING: Exactly.

23 DR. APOSTOLAKIS: Okay?

24 So, you're working with the goals. After all, you
25 know, if the agency has goals, we should try to meet them,

1 right?

2 And I think that would be a good place to -- all
3 I'm saying is revise it.

4 Now, the other place where I think you should
5 spend some time revising is the section on the definition of
6 defense-in-depth.

7 MR. KING: Are you in the paper or the framework
8 now?

9 DR. APOSTOLAKIS: In the Commission paper.

10 MR. KING: The paper.

11 DR. APOSTOLAKIS: Defense-in-depth -- I mean I'm
12 not sure I see a definition here. It's a description, but
13 it's not a definition, and I think that -- I mean the
14 Commission itself, in its white paper, has a discussion of
15 defense-in-depth, right?

16 MR. KING: Yeah. They have a high-level, sort of
17 like a philosophy-type discussion.

18 DR. APOSTOLAKIS: What is really relevant to your
19 work here is that defense-in-depth really handles
20 un-quantified uncertainty.

21 We can talk about it forever, but what it comes
22 down to is that if you are uncomfortable with what you have
23 done, which means you have uncertainties, you put an extra
24 barrier. You have larger margins.

25 That's really what it comes down to. That's what

1 defense-in-depth is.

2 That's a structuralist interpretation.

3 DR. KRESS: George, I have a little problem with
4 that, because I can conceive of defense-in-depth being
5 incorporated to compensate for quantified uncertainty just
6 as well.

7 DR. APOSTOLAKIS: Then it's not defense-in-depth.

8 DR. KRESS: Well, it depends on your definition of
9 defense-in-depth.

10 DR. APOSTOLAKIS: Then you are using standard
11 engineering tools like redundancy and so on to achieve a low
12 frequency and a low uncertainty, but I think
13 defense-in-depth, in the nuclear industry, really means a
14 structuralist approach, where you're using multiple barriers
15 without really quantifying their impact.

16 DR. KRESS: Of course, if you define it that way,
17 yeah.

18 DR. APOSTOLAKIS: But don't you think that most
19 people think of it that way?

20 DR. KRESS: Yeah, I agree most people think of it
21 that way.

22 DR. APOSTOLAKIS: And in fact, you can say that,
23 most people think of it that way.

24 MR. KING: Well, the approach we're taking applies
25 both.

1 There's some structuralist elements to it that
2 you're going to have regardless of what your PRA numbers
3 say, and then there's the quantified uncertainty which will
4 also help you make decisions on redundancy and diversity and
5 those kinds of things.

6 DR. APOSTOLAKIS: Right. But I think when say
7 defense-in-depth, we really mean the structuralist. In
8 other words, we mean as a principle rather than as a tool to
9 work with, but I mean if you feel that's important, you can
10 put that there, as well. But there is controversy -- not
11 controversy but some question as to what exactly it means,
12 but most people would interpret it this way, and then the
13 strategies are to do what you have here, okay, because the
14 heading is definition of defense-in-depth, and if you say
15 definition, you might as well define it or say that there
16 are many definitions.

17 But other than that, I think the description that
18 you have is fine. It's just that the conceptual part, I
19 think, should be beefed up a little bit.

20 MR. KING: Okay.

21 Anything else before Mary talks about 50.44?

22 DR. SHACK: Yeah. I have one more question I was
23 interested in in the framework document itself, and that is
24 this notion that you were seeking explicit addressing of
25 safety-significant issues in the regulations.

1 When you've done that, what is the point of it?

2 You know, normally I think of the regulations as
3 setting up a design envelope that doesn't address everything
4 explicitly, but it's a performance measure. When you're all
5 said and done, you know, does your PRA say that you're okay,
6 and it's -- there's not a problem if it's not explicitly
7 addressed.

8 Is the goal here to recast the regulations so that
9 they explicitly address the safety concerns?

10 MR. KING: I think the short answer is yes, and I
11 think you'll see an illustration of that when you look at
12 50.44, because the PRA is saying there's some accident
13 sequence that today's regulations don't deal with. I think
14 what we want to recommend as part of a risk-informed
15 alternative is a revision to that regulation that does deal
16 with that, you know, significant sequence.

17 DR. SHACK: Even though the results from the other
18 design processes give you low probabilities, low
19 contributions to CDF, just because it's not explicitly
20 addressed, you're saying it's significant in the sense that
21 it's a large contributor, it's a high value?

22 MR. KING: Yes. And we're not talking about
23 putting CDF values in the regulation. We're talking about
24 revising the deterministic regulation to fill a gap. As I
25 said, you're going to see that when we get to igniters and

1 should they have back-up power to be able to be operable
2 during a station blackout sequence.

3 For Mark III's and ice condensers, when we got
4 into 50.44, we saw that as -- for those containment types --
5 is a significant safety concern, and our risk-informed
6 alternative attempts to deal with that.

7 DR. KRESS: I was trying to thumb through your
8 slides.

9 Are you going to discuss at all your Figure 3.1 of
10 the framework document, which has the quantitative values in
11 it for prevention and mitigation and for the various
12 initiating frequency events?

13 MR. KING: No, we weren't planning to put that up
14 and talk about it. If you want to talk about it, we can
15 talk about it.

16 DR. APOSTOLAKIS: You want us to write a letter on
17 the whole document, not just the 50.44.

18 MR. KING: Well, the paper to the Commission is
19 providing the framework document. It's the next -- it's an
20 updated version. We're not asking for the Commission to
21 approve that at this point. So, we're not asking the
22 committee to write a letter on it.

23 But we are asking the Commission to approve
24 proceeding with a risk-informed alternative to 50.44, and we
25 would like the committee to write a letter on that piece of

1 it.

2 DR. APOSTOLAKIS: Okay. So, we will have another
3 opportunity to look at the attachment?

4 MR. KING: The framework?

5 DR. APOSTOLAKIS: Yeah.

6 MR. KING: Yeah.

7 DR. APOSTOLAKIS: This is a big document.

8 MR. KING: The framework's a living document. I
9 mean as we apply it --

10 DR. APOSTOLAKIS: So, we'll have an opportunity to
11 kill it.

12 MR. KING: You've had that opportunity.

13 DR. APOSTOLAKIS: Yeah, because I think there are
14 so many ideas here that we really need -- in fact, we may
15 even need a subcommittee meeting.

16 MR. KING: Yeah, we had talked about, before,
17 having a subcommittee just on the framework document.

18 DR. APOSTOLAKIS: Yeah, I think we should do that.

19 MR. KING: Okay.

20 DR. APOSTOLAKIS: But coming back to the --

21 MS. DROUIN: And there have been some changes
22 already on the framework document --

23 DR. APOSTOLAKIS: I noticed that, Mary.

24 MS. DROUIN: -- than the one you have.

25 DR. APOSTOLAKIS: I noticed that.

1 Just so that you don't think I'm a negative guy,
2 on the paper to the Commission, I really like the paragraph
3 on page 5, accordingly the staff recommends that the safety
4 goals be used, and I really like your section on selective
5 implementation, okay? I thought it was great.

6 MS. DROUIN: Thank you.

7 MR. KING: Thank you.

8 DR. APOSTOLAKIS: Just to be fair.

9 Okay.

10 So, maybe we can discuss with Mr. Markley later
11 about setting up a subcommittee meeting to discuss the
12 framework itself.

13 MR. KING: Yeah. And that would be where we could
14 get into the Figure 3.1.

15 DR. APOSTOLAKIS: Okay.

16 DR. KRESS: I'll reserve my questions, then, for
17 that.

18 MR. KING: All right.

19 Why don't we go through 50.44?

20 DR. APOSTOLAKIS: Good.

21 MS. DROUIN: Before we start, how much time do we
22 have left?

23 DR. SHACK: Fifteen minutes.

24 MS. DROUIN: Okay. Then why don't we go to page
25 4?

1 DR. WALLIS: Well, on page 2, you have objectives,
2 and I have to look at what you do in the light of your
3 objectives, and the first one says enhanced safety and the
4 last one says without compromising safety. So, when I look
5 at what you're proposing, should I apply the criterion of
6 enhancing or not compromising?

7 DR. APOSTOLAKIS: Where is this now, Graham?

8 DR. WALLIS: I'm trying to evaluate what they are
9 proposing, and they're saying I have to do it in the light
10 of some objective.

11 So, should I look at what you're doing in saying
12 these guys are relaxing a bit but it hasn't compromised
13 safety, or shall I look and see if you've enhanced safety?
14 That's all. It's a simple question.

15 MS. DROUIN: If you look at the first bullet, it's
16 enhance it commensurate with their importance to health and
17 safety.

18 I don't think that these are contradictory. I
19 mean you want to try and enhance safety.

20 DR. WALLIS: Is this a criterion for what you're
21 doing, though?

22 MR. KING: These are general words.

23 DR. WALLIS: Well, I think you ought to be very
24 careful with these general words, because I want to take
25 them seriously, and I want to say is what you're proposing

1 here going to enhance safety or not?

2 MR. KING: I think there's both components in
3 50.44. The enhanced safety part comes where we've talked
4 about potential gap on back-up power to the igniters that we
5 saw. That's an enhanced safety. But also, as we go through
6 and risk-inform other pieces and remove unnecessary burden,
7 we don't want to do that by compromising safety.

8 So, I don't think they're contradictory. I think
9 they're talking about two different aspects of what we're
10 doing.

11 DR. APOSTOLAKIS: Wouldn't it be better to have
12 the first bullet start as focus NRC and licensee resources
13 in areas, drop "enhance safety by"?

14 MS. DROUIN: Well, these words are words that
15 appeared -- I mean these are words that --

16 DR. APOSTOLAKIS: -- the Commission used.

17 MS. DROUIN: -- I think are directly out of the
18 reg guide.

19 MR. KING: I think these came directly out of
20 98-300, as I remember, and if we had to write them today,
21 maybe we'd write them --

22 DR. WALLIS: I'm just trying to keep you in the
23 discipline of checking that what you actually propose does
24 -- is commensurate with your objectives, as stated.

25 MS. DROUIN: Well, I think that you do enhance

1 safety when you re-focus your resources on those areas that
2 are commensurate with their importance.

3 When you focus something in areas that are not
4 important, I think you're taking away from safety. I think
5 when you focus on --

6 DR. WALLIS: This is a vague idea, though. Okay.
7 Again, I think, if you're going to enhance safety --

8 MS. DROUIN: I do think you do enhance safety by
9 that.

10 DR. WALLIS: -- you ought to have a measure of
11 safety and not use it as a vague, hopeful term.

12 I'd like to move on now.

13 Just be careful about the use of these words.

14 MS. DROUIN: When you look at 50.44, it is a
15 regulation that, on the surface, appears rather simple, but
16 it's not as simple as people like to think.

17 It is a fairly prescriptive regulation. It gets
18 into quite a bit of detail in specifying very particular
19 requirements.

20 It has two sets of requirements.

21 The first one -- I like to refer to them as the
22 analytical requirements.

23 It gets in and specifies the type of accidents
24 that need to be considered when you're looking at
25 combustible gases, what type of combustible gas, it looks at

1 where -- the source from that combustible gas and, you know,
2 the amount. It's very specific in those areas.

3 DR. POWERS: Let me ask about the -- a couple of
4 things about the type of accident to be considered.

5 When we think in terms of a risk-informed
6 approach, we tend to think of those models that are used in
7 association with risk models for accidents.

8 They typically have a cut-off time of about 24
9 hours in their modeling of accidents. Are you looking at 24
10 hours as a cut-off time?

11 MS. DROUIN: I'm going to put that off, because we
12 are going to get into the timeframe.

13 DR. POWERS: Okay.

14 MS. DROUIN: We look at before and after the 24
15 hours.

16 DR. POWERS: When we think about those accidents,
17 we tend to think about some fairly classic accident analyses
18 which are limiting cases, maybe a large-break LOCA, but
19 those accidents are stylized in the sense that operator
20 actions that are not proceduralized are not credited in
21 those accident analyses, and so, they stand in some contrast
22 to the accidents that actually occur.

23 I'm think of TMI, where operator actions did
24 occur, even though they were not proceduralized, and those
25 operator actions tend to put water on the core, and water

1 tends to turn into hydrogen under these circumstances.

2 So, when you think about types of accidents, are
3 you only looking at these fairly stylized accidents, or are
4 you considering the range of possible operator actions that
5 are not proceduralized that might change either the timing
6 or the magnitude of hydrogen generation?

7 MS. DROUIN: I would say that we're looking at all
8 ranges. We aren't just considering the stylized one. And
9 that leads us to some of the recommendations.

10 DR. WALLIS: If you look at the last part here,
11 there's 75 percent and 5 percent. These are very arbitrary,
12 prescriptive requirements. It would seem to be that
13 risk-informing ought first to look at those numbers and say
14 where did they come from, what's the probability of them,
15 what's a more likely, realistic reaction? Then we know what
16 we're dealing with.

17 MS. DROUIN: I agree.

18 DR. WALLIS: But you're going to take them as
19 gospel?

20 MS. DROUIN: No.

21 DR. WALLIS: You're going to question them and
22 you're going to look at them.

23 MS. DROUIN: Yes.

24 DR. WALLIS: Okay.

25 MR. KING: This is what's in there today.

1 DR. WALLIS: All right. That's good.

2 MS. DROUIN: When you look at the analytical
3 requirements that are in the regulation, there's actually
4 what I call physical requirements that are in there to
5 prescribe how you should address the analytical ones, and
6 there's six high-level ones, and there's a lot more to these
7 requirements, but this is what's actually in the regulation.

8 If you start looking at the implementing documents
9 and associated regulations, you get into more detail, but
10 this is all the regulation requires, to measure the hydrogen
11 concentration in the containment, ensure a mixed containment
12 atmosphere, control your combustible gas concentration --
13 that's where you see the recombiners -- install your
14 high-point vents, and those, so far, apply to all your
15 reactors, all your containment types.

16 The last two are specific to particular
17 containments, inerting your atmosphere, of course, for your
18 Mark I's and Mark II's, and having your igniters actually
19 providing the hydrogen control system for your Mark III's
20 and your ice condenser containments.

21 So, in the current 50.44, on the previous slide
22 and this slide, that's what the current 50.44 requires
23 licensees to do.

24 Before determining what our recommendation would
25 be, we tried to go back, starting with why the regulations

1 came about the way they did and looking at all the risk
2 studies that are out there, what would be our current
3 understanding of the risk significance of combustible gases,
4 and I just tried to put some highlights here.

5 The biggest one, of course, is that, you know, you
6 can get from -- you can get your combustible gases from your
7 core damage and your core melt accidents, from all accident
8 types.

9 It's not just restricted to your LOCAs, which you
10 saw as one of your analytical requirements, and it's not
11 just to core damage to a degraded core.

12 You can get your combustible gases from your
13 core-concrete interaction.

14 That gets to some of the points that you were
15 bringing up, Dana.

16 DR. WALLIS: All your slides have words. Do any
17 of them have any numbers on them?

18 MS. DROUIN: What do you mean numbers?

19 DR. WALLIS: Well, you give us all these
20 reassuring statements.

21 I presume they're based on analysis and someone's
22 numbers?

23 MR. KING: Yeah, they're based upon looking at
24 IPE's, looking at NUREG-1150, available PRA results.

25 DR. WALLIS: So, behind them all, if someone asked

1 how do you know something, you could say -- you could pull
2 out some numbers and just show us that it's not just a dream
3 but a reality.

4 MS. DROUIN: Absolutely. When you go through the
5 50.44 report, we do have a little table in there under each
6 of the containment types that gets into the accidents and
7 show what the numbers are that we pulled from the different
8 risk studies.

9 DR. POWERS: 50.44 is my favorite report on the
10 IPE insights document?

11 MS. DROUIN: I'm sorry?

12 DR. POWERS: 50.44 is the IPE report on -- IPE
13 insights document?

14 MS. DROUIN: 50.44 is the number for the
15 regulation.

16 DR. POWERS: I don't remember reports by numbers.

17 MS. DROUIN: Oh, I'm sorry.

18 MR. KING: 1560 is the IPE insights.

19 DR. POWERS: Still one of my favorite reports.

20 MS. DROUIN: Thank you.

21 The biggest thing you do see from the numbers is
22 that third bullet, is that for not all containments, not all
23 accident sequences, but there are certain accident sequences
24 and for certain containment types, you do see conditional
25 containment failure -- sorry -- a conditional large early

1 release probability ranging from .1 to 1.

2 DR. KRESS: That's sequence by sequence. That's
3 not the aggregate.

4 MS. DROUIN: No, not the aggregate.

5 DR. KRESS: So, in essence, you would look at that
6 in the light of the actual frequency of that particular
7 sequence.

8 MS. DROUIN: Yes.

9 DR. KRESS: Okay.

10 MS. DROUIN: Yes. But this was just to point out
11 that there is a concern there. You are seeing relatively
12 high contributions.

13 DR. WALLIS: There's nothing less than .1?

14 MS. DROUIN: Yes.

15 DR. WALLIS: Never less than .1?

16 MS. DROUIN: No, you do see some less than .1.

17 DR. WALLIS: Well, you say ranges from .1 to 1.

18 MS. DROUIN: Depending on the containment types.

19 DR. WALLIS: But it's not less than .1, then.

20 MS. DROUIN: You do see some less than .1.

21 DR. KRESS: I'm sure there are initiating events
22 that are --

23 DR. SHACK: They're only worried about the ones
24 that are larger than .1.

25 MS. DROUIN: I'm saying the fact that you do see

1 some stuff from .1 to 1, you have a concern.

2 If everything was less than .1, we would not have
3 a concern here.

4 DR. WALLIS: But the impression I get is that
5 everything is in that range.

6 MS. DROUIN: No.

7 DR. KRESS: It doesn't say that.

8 DR. WALLIS: So, you're telling me the range is
9 from zero to 1. That's pretty good.

10 MS. DROUIN: Yes.

11 DR. WALLIS: That's an informing statement.

12 DR. SHACK: No, what she's trying to emphasize is
13 that there are a significant group where they're fairly
14 large, which is greater than .1.

15 MS. DROUIN: Yes.

16 Now, when you start looking at the generation of
17 your combustible gases and you start looking at it in your
18 time periods, the biggest thing is, when you look at it for
19 less than 24 hours, in many cases, it's not so much of a
20 significant challenge to containment integrity, but when you
21 do start considering past the 24 hours, after the onset of
22 core damage, where people did not think there was a concern,
23 we still think there is a concern.

24 DR. KRESS: But that bullet needs to be said that
25 it's not a significant challenge because we have

1 regulations.

2 MS. DROUIN: Yes, I didn't go into the bullets
3 there. I apologize.

4 DR. KRESS: I mean it would be a significant
5 challenge if you didn't have these regulations.

6 MS. DROUIN: If you did not inert it or you did
7 not have the igniters, absolutely, absolutely.

8 DR. SEALE: Yeah, but if the igniters work, it's
9 hard to build up an awful lot of pressure from water vapor
10 as long as the temperature is below saturation.

11 MR. KING: If the igniters work, we're in pretty
12 good shape.

13 DR. SEALE: Even after 24 hours.

14 MR. KING: Even after 24 hours. The concern we
15 had is station blackout where the igniters don't work.

16 DR. SEALE: That's a separate case.

17 MS. DROUIN: I'm going to skip over to 8 and just
18 try and go through each of the requirements.

19 If we start with the analytical requirement, the
20 bottom line is here -- I mean I use the word "enhance," but
21 what we're talking about is that, as far as the analytical
22 requirements, we think that they ought to be -- and this
23 goes back to our -- one of our principles or ground rules in
24 our framework for risk-informing, is that the analyses
25 behind the technical requirements should be realistic, so

1 that we are going to revisit that.

2 The requirements should not be conservative,
3 shouldn't be bounding. That should go more into the
4 acceptance criteria.

5 So, since this is one of our fundamental things
6 and there has been a lot of work done in this area, so we
7 are not talking about going off and doing years of research.
8 We're talking about, over the next couple of months, doing
9 some calculations.

10 So, the biggest thing there is to try and base the
11 analytical stuff on realistic analysis.

12 If I go into --

13 DR. POWERS: When you say you're going to do some
14 calculations, you're talking about this within-24-hour
15 period of time.

16 MS. DROUIN: Yes.

17 DR. KRESS: When you talk about a hydrogen source
18 term, you're including the quantity versus time or
19 concentration versus time?

20 MS. DROUIN: Right. You're looking at the amount
21 and the rate.

22 DR. KRESS: And that would be -- that seems to me
23 like that would be accident- and plant-specific. You're
24 going to try to bound it in a risk-informed manner?

25 MS. DROUIN: Well, you would do it for certain

1 particular accident sequences under certain different
2 conditions.

3 MR. KING: But you're right. I mean, BWR versus
4 PWR, that kind of thing --

5 DR. POWERS: I think that you could probably do it
6 for a set of representative plants.

7 DR. KRESS: So, they're going to have more than
8 one hydrogen source term.

9 MR. KING: We might have a B and a P. The idea
10 was to go back and take a look, instead of just having one
11 number now, without a rate, to go take a look and see, you
12 know, should we have one, should we have two, three, but
13 whatever it is, based upon some realistic calculations.

14 I mean sort of our gut feeling is, when we're all
15 done, it isn't going to change, you know, the need to inert
16 Mark I's and II's and the need to have igniters on III's and
17 so forth, but it's sort of like a confirmatory-type step
18 that we want to go through.

19 MS. DROUIN: Yes.

20 On the measuring of the hydrogen concentration, in
21 our risk-informed alternative, we're recommending that this
22 particular requirement be eliminated, so it would not show
23 up in the risk-informed alternative.

24 One of the things that you will see on each of the
25 slides is a last bullet that addresses Mr. Christie's

1 petition, because in our SECY, in our report, we're
2 providing some of the technical basis to his petition.

3 So, we're trying to show you also a comparison of
4 where our recommendation -- where it does or does not match
5 up with his particular petition.

6 On this particular one, he is also requesting the
7 elimination of this particular requirement.

8 DR. KRESS: I see to remember that they used that
9 as part of their guidance on emergency response measures?

10 MR. KING: Yeah. Emergency response measures
11 require looking at hydrogen, and I think the thing that
12 we're talking about here is we're not changing what needs to
13 be done under the emergency response measures --

14 DR. KRESS: I see.

15 MR. KING: -- and whatever -- in terms of the
16 safety grade, nature of whatever instruments they're using,
17 that would stay the same, but what we're doing under 50.44,
18 since it doesn't -- monitoring hydrogen doesn't really
19 impact when you turn the igniters on and that kind of stuff,
20 we're eliminating it from this regulation.

21 DR. KRESS: So, there may still be hydrogen
22 monitors as a result of some other regulation.

23 MS. DROUIN: Absolutely.

24 DR. KRESS: You're looking at 50.44, in this case,
25 in isolation.

1 MS. DROUIN: Right, 50.44.

2 I'm trying to go through this pretty quick, for
3 time's sake.

4 DR. WALLIS: Are you going to get to a bottom line
5 at the end?

6 MS. DROUIN: The bottom line?

7 DR. WALLIS: Yeah.

8 MS. DROUIN: Well, they're on each of the slides.

9 I wasn't going to go through all the bullets, just
10 kind of give you the bottom line on each one of the
11 requirements.

12 DR. WALLIS: Yeah, but you're going to say all the
13 things you're going to do.

14 What's the consequence of all the things you're
15 going to do?

16 MR. KING: The bottom line is some burden
17 reduction and some safety enhancement.

18 MS. DROUIN: Some safety enhancements.

19 DR. WALLIS: Do you have a measure of that safety
20 enhancement?

21 MR. KING: We have a measure in terms of
22 eliminating the sequences that have a high conditional core
23 damage probability.

24 DR. WALLIS: So, you could measure -- give us a
25 measure in terms of CDF or LERF or something?

1 MR. KING: Not CDF.

2 DR. WALLIS: LERF?

3 MR. KING: When you get hydrogen, the core has
4 already been damaged, but it's the LERF, yeah, the LERF
5 aspect of it.

6 MS. DROUIN: The next set of requirements, when
7 you looked at them, it's atmosphere, controlling hydrogen
8 for your postulated LOCA, which gets into your recombiners,
9 inerting your Mark I and II's.

10 Well, the first one, the first two -- sorry. I
11 was going to say something totally incorrect.

12 Ensuring the mixed atmosphere -- we aren't
13 proposing any changes to this one, keep it as is. We aren't
14 going to enhance. We aren't going to delete. It would
15 remain the same, in the alternative.

16 DR. POWERS: In your sub-bullets on this, you
17 bring up GDC-50. My recollection of GDC-50 may be
18 incorrect, but it is my impression that it does not speak to
19 a 24-hour requirement --

20 MS. DROUIN: I'm sorry?

21 DR. POWERS: -- that GDC-50 speaks to -- seems to
22 speak to all time.

23 MR. KING: Right.

24 DR. POWERS: So, that aspect of GDC is going to be
25 sacrificed?

1 MS. DROUIN: No, no.

2 In going through and looking at the purpose for
3 retaining the requirement, and if you go back earlier, we
4 were saying what the risk significance is, and if you go
5 back to our definition of defense-in-depth, we're modifying
6 either because the risk is showing us, but there are also
7 elements of it that, regardless of the risk, we will retain
8 because of the defense-in-depth elements.

9 If we were to look at this strictly from the risk
10 perspective, that would lead us to eliminate this
11 requirement, but when we're looking at the defense-in-depth
12 elements and we look -- which part of it was to meet the
13 intent of the GDCs and you look at GDC-50, then that leads
14 us to you really shouldn't touch this requirement, to leave
15 it alone. So, it's not going to change the GDC.

16 DR. POWERS: I think what motivates "ensure a
17 mixed atmosphere" is the models that you have for
18 calculating what the combustion -- combustibility and the
19 consequences of combustion really are fairly poor at
20 handling stratified environments.

21 I mean you have a major uncertainty there in your
22 phenomenological analysis that you really can't tolerate.

23 MS. DROUIN: Uh-huh.

24 DR. POWERS: The models are just poorly suited for
25 that sort of thing, and so, you retain the mixed atmosphere

1 so that all of the phenomenological base and the numbers
2 that you're going to give Mr. Wallis are still valid.

3 MS. DROUIN: Okay.

4 DR. APOSTOLAKIS: So, from the risk perspective,
5 you would not eliminate it, then, based on what Dr. Powers
6 just said.

7 You just can't quantify it, but you know it's a
8 bad thing.

9 MR. KING: What Mary's saying is we're not
10 proposing any changes.

11 DR. APOSTOLAKIS: But the argument that, from the
12 risk perspective, you would probably eliminate this
13 requirement probably is not true, based on what I just
14 heard.

15 MR. KING: We did not, I think, take a serious
16 look at eliminating it, given your argument, given the fact
17 that you had GDC-50, we didn't spend a lot of time looking
18 at trying to eliminate it.

19 DR. SIEBER: I guess one of the problems, though,
20 is that GDC-50 becomes an assumption that says, yeah, there
21 is mixing, and so we know something about the force of
22 combustion.

23 On the other hand, if you have a LOCA and you're
24 relying to any extent on fan coolers, the fan coolers will
25 either fail or trip during the process of the LOCA, so you

1 have to rely on natural phenomena in order to assure that
2 mixing, and it's not all that clear to me that adequate
3 mixing occurs under those circumstances.

4 DR. POWERS: Well, it's not unclear to you. It's
5 not clear to the codes either, because they lack the ability
6 to do natural circulation very effectively. I mean they can
7 hook it up, and one of Graham's favorite equations, the
8 momentum equation, causes some headache in lump node codes.

9 MR. KING: There has been some experimental work
10 that's been done since the hydrogen rule was written that
11 does help us believe that, particularly for the plants that
12 have igniters, that pockets that don't collect to detonable
13 mixtures before it migrates to igniters and you get some
14 burning to take place. We've done some full-scale testing.

15 DR. POWERS: Except where you have dead-end
16 condensation sources, sites.

17 MR. KING: And Generic Issue 121 looked at
18 hydrogen needs for large drives and looked at pocketing that
19 could occur, particularly in closed compartments, and
20 concluded that the amount that's going to occur and the
21 detonations that may occur there are not
22 containment-threatening type of things. So, there's been a
23 lot of work that's been done over the past 10 or 15 years.

24 DR. KRESS: Let me ask a strange question. I
25 think it's strange.

1 You're focusing on -- to a large extent -- on
2 conditional probability of containment failure. Suppose you
3 had a sequence of events where you didn't fail containment
4 but you had a significant amount of hydrogen produced and
5 fission products produced and went into containment, and
6 then you had a hydrogen combustion event.

7 Because of the increased pressure, you're going to
8 enhance the fission product leakage out of the leak paths in
9 the containment, not a failed containment, the leak paths,
10 to the extent you might exceed 10 CFR 100 guidelines,
11 because the design basis for that doesn't include hydrogen
12 pressure. It talks about the large-break LOCA pressures.

13 How are you protecting against these kind of
14 smaller effects that some of the regulations might be trying
15 to protect against?

16 I mean it seems to me like conditional probability
17 of containment failure is somewhat limited in terms of all
18 the regulatory objectives.

19 Is that a consideration in there anywhere? Do you
20 deal with that some way?

21 MR. KING: I think the key consideration is what
22 do you define as containment failure?

23 You're sort of in two different spaces.

24 Part 100 space is design basis, very stylistic
25 accident, very conservative, you know, assumptions on

1 transport off-site and so forth.

2 That was looked at back when Appendix J, I think
3 it was, was revised, and basically, the conclusion was
4 you've got to really have a high leak rate before you even
5 start to worrying about risk-significant releases.

6 DR. KRESS: I was thinking in terms of FC curves
7 again, but there is consequences due to leakage of fission
8 products, and you might want to have limits to -- at high
9 frequency, low releases, and as the frequency goes up, you
10 can stand the higher -- I mean the frequency goes down, you
11 can stand the higher releases, but we don't deal with that
12 whole curve. We just deal with the -- here, it seems like
13 we're dealing with the upper end of it.

14 MR. KING: We deal with one end of that curve.
15 Recognize, what we're doing is a feasibility study. This is
16 not the end of the story. And I don't think we've gotten
17 into that level of detail as part of this feasibility study,
18 at least the stuff that I've seen, we haven't.

19 MS. DROUIN: Also, if I understood -- and I might
20 have misunderstood what you were saying, but it sounded to
21 me that you were talking more about a regulation that would
22 be a containment regulation versus a regulation that's
23 dealing with combustible gases.

24 DR. KRESS: Normally, when we calculate the design
25 basis accidents, we don't include hydrogen pressure in those

1 except for some specific parts of the containment analysis,
2 but what I really had in mind was, if you did a PRA and
3 calculated the actual fission product releases, even from
4 un-failed containments, there may be reasons to limit those,
5 and the rules you have on hydrogen in terms of what's
6 required, even then, even the recombiners may have some
7 effect on that for some sequences, and you know, you may be
8 exceeding a value that is not going to kill people, but you
9 didn't want to release that amount of fission products
10 anyway.

11 MR. KING: We haven't done the calculations to do
12 what you're talking about. I think, if we did them, we'd
13 probably find out that the risk significance of those type
14 of situations isn't very much.

15 DR. KRESS: Probably very low. That's because
16 we're defining risk in terms of the safety goals.

17 MR. KING: Right. But I'm saying that based upon
18 the Appendix J work that's been done, where they did look at
19 higher release rates.

20 DR. KRESS: I'm sure that's what you'll find.

21 MR. KING: And also, when you look at realistic
22 off-site transport versus the Part 100-type calculation,
23 there's a big difference in terms of the way it's treated
24 there, as well.

25 DR. SHACK: We're going to have to move. We're

1 running behind.

2 MR. LEITCH: I just have one question regarding --
3 it looks as though you have a concern about power supply to
4 igniters during station blackout conditions.

5 Certain BWR Mark II's have post-LOCA hydrogen
6 recombiners.

7 Is there a similar concern with power supplies to
8 those hydrogen recombiners?

9 MS. DROUIN: For the hydrogen recombiners, we're
10 proposing eliminating that requirement. That's not a
11 concern there.

12 MR. KING: The answer is basically no, because
13 they're inerted containments, and it would take a long time
14 to de-inert from radiolysis or whatever is occurring.

15 DR. WALLIS: On page 11, you say the type of
16 accident, not risk significant. This is what type of
17 accident?

18 MS. DROUIN: Postulated LOCA.

19 DR. WALLIS: A LOCA is not a risk-significant
20 accident?

21 MS. DROUIN: Excuse me?

22 DR. WALLIS: LOCA is not a risk-significant
23 accident?

24 DR. SHACK: The hydrogen you generate.

25 MS. DROUIN: No, the LOCA -- a large-break --

1 sorry -- a postulated loss-of-coolant accident is not
2 showing up as a contributor, as a large contributor.

3 DR. POWERS: Hardly even makes the cut-sets on
4 most plants.

5 DR. WALLIS: Okay. So, what's the criterion for
6 not risk significant?

7 You have a number that you use to decide if it's
8 significant or not. What is it?

9 MS. DROUIN: That gets back into our framework,
10 and depending -- it's 10 to the minus 5. That's what we're
11 using. 10 to the minus 4 for the core damage frequency.

12 DR. KRESS: That was one of my questions that I
13 wanted to ask you about the table. This looks like an
14 opportunity to do it.

15 DR. POWERS: No, it's not. We're out of time.

16 DR. KRESS: Okay. Maybe I won't ask it.

17 DR. BONACA: That is specified when you mean the
18 50.46 LOCA here.

19 MS. DROUIN: Yes.

20 DR. BONACA: There are very specific criteria on
21 the amount of oxidation and so on and so forth.

22 So, there is a quantification there to support the
23 statement.

24 DR. WALLIS: What are your objectives, and what
25 are the criteria you're using? That's why I'm asking this

1 question.

2 I think it would be helpful if, instead of all
3 these words, you simply say we applied these criteria, this
4 led us to these conclusions, and that's why you should
5 support what we want to do, and if you don't give us that
6 logic, it's all words, and I just can't grasp anything.

7 DR. KRESS: Well, that logic is kind of in the
8 framework document.

9 MR. KING: It's in the framework. You go back to
10 the framework table. It has CDF and LERF values on it.
11 Take a look at the sequence.

12 DR. WALLIS: But you're telling me to read
13 something which isn't being presented.

14 MS. DROUIN: Well, it would have come out if we'd
15 had more time. We would have explained it better.

16 DR. WALLIS: Well, maybe, then, you should
17 concentrate on the things you omitted.

18 DR. POWERS: It seems like all your slides are
19 very clear except for this long-term one, just because this
20 is unique.

21 MS. DROUIN: We are proposing -- this would not be
22 a requirement in 50.44, but we are recommending to the
23 Commission that, after the 24 hours, because we still feel
24 there is a concern, that this be addressed under the severe
25 accident management guidelines.

1 DR. WALLIS: I'm sorry. I've got to ask you a
2 question on number 15.

3 It says maintain containment integrity for all
4 risk-significant events.

5 Does that mean additional failure probability of
6 zero?

7 MS. DROUIN: No.

8 MR. KING: Less than .1, which is our framework
9 document.

10 DR. WALLIS: So, maintain integrity, the public
11 has to understand, means live with a 10-percent probability
12 of failure.

13 MR. KING: Conditional.

14 DR. WALLIS: You've got to say that. I mean
15 containment integrity, to me, means it doesn't break, and
16 you're saying containment integrity to you means that it has
17 a 10-percent failure probability.

18 MR. KING: Yes.

19 DR. WALLIS: I think that should be clear. I
20 don't think you should use words lightly like that.

21 DR. KRESS: The .1 -- is that the aggregate for
22 all sequences, or is that for each sequence?

23 MR. KING: It's intended to be the aggregate for
24 all sequences.

25 I think what we found out is, you know, a lot of

1 sequences at zero, and it's only a couple of specific ones
2 that -- like one or two that gets you anything.

3 DR. KRESS: So, in practice, you can apply it on a
4 sequence basis --

5 MR. KING: Yeah.

6 DR. KRESS: -- as opposed to the aggregate.

7 MR. KING: In practice, yes.

8 DR. KRESS: I got my question in after all.

9 DR. POWERS: There you go, Tom.

10 MS. DROUIN: When you're looking at this bullet
11 and you go back to the framework, you know, there are four
12 strategies, and so, this is trying to get to a
13 performance-based one where -- and we just gave one small
14 part of the whole performance-based requirement, but you
15 could come in on any of those levels and show that you met
16 it.

17 So, instead of maybe coming in -- saying you were
18 a plant that you didn't want to have igniters, for whatever
19 reason, I mean you can come in and show that your
20 risk-significant accidents aren't contributing, you're below
21 those numbers that we have in the framework.

22 These numbers would not appear in the regulation,
23 but this would be more a description in how you would meet
24 this in your regulatory guidelines, or you'd come in and
25 look at your whole accident or you'd come in and show that

1 you're not threatening your containment, and there would be
2 many different ways to meet this one.

3 DR. WALLIS: Mr. Christie's statement, "can
4 withstand the hydrogen burn," to me that means hydrogen burn
5 happens and nothing happens to the containment. Do you mean
6 there's a .1 percent of failure probability?

7 MS. DROUIN: These are Mr. Christie's words out of
8 his submission.

9 DR. WALLIS: But you quote them.

10 If I were a tire manufacturer and I said my tires
11 won't lose their tread and then what it really meant was .1
12 probability, that's a tremendous difference in statement.

13 DR. KRESS: If you had an alternative requirement
14 like this, would you cast it in terms of means?

15 MS. DROUIN: Yes.

16 DR. KRESS: That's because the safety goals are
17 specified as means?

18 MS. DROUIN: Yes.

19 DR. WALLIS: I guess I'll have to ask Mr. Christie
20 what he means, but you believe that your equivalent -- your
21 recommendation is equivalent to his.

22 MS. DROUIN: Yes, we do. We believe it addresses
23 his concern.

24 DR. KRESS: If you cast this in terms of means,
25 does that mean you have to have a PRA with an uncertainty

1 analysis to determine what the mean is?

2 MR. KING: Where we've had such information,
3 that's what we've used.

4 Where it's been point estimates, we don't take a
5 point estimate for a single plant. We look at a whole
6 ensemble of what came out of the IPEs, and you know, they
7 define a range, basically, also.

8 DR. KRESS: That's a kind of a mean, yes.

9 MR. KING: I'm not going to call it a mean, but
10 it's not a point estimate. It's looking at a range of
11 calculations that have been done.

12 DR. KRESS: This is for a specific licensee to use
13 an alternative requirement, and it's for his plant, and he'd
14 have to do a PRA for his plant, it seems to me like, and
15 he'd have to do an uncertainty analysis to determine what
16 his mean is, or do something that assures the point estimate
17 he gets is higher than the mean or something.

18 MR. KING: Do a mean or do a certain set of
19 sensitivity analysis to show that he's got a reasonable
20 number.

21 MS. DROUIN: You're going to have to have an
22 understanding of your uncertainty and the impact on the mean
23 value, absolutely.

24 MR. KING: Anyway, the bottom line of what we're
25 recommending is eliminate the requirement for hydrogen

1 recombiners, for hydrogen monitoring.

2 If station blackout is a risk-significant
3 sequence, provide back-up power to the igniters for Mark
4 III's and ice condensers and have basically a practical
5 cutoff of 24 hours beyond that, let your severe accident
6 management program deal with situations -- long-term
7 situations.

8 MR. LEITCH: And the elimination of the hydrogen
9 recombiners -- does that impact in any way the requirement
10 that containment is allowed to be inerted -- excuse me --
11 de-inerted 24 hours prior to shutdown and not required to be
12 inerted until 24 hours after startup?

13 MR. KING: No, we're not proposing any change to
14 that.

15 Mark I's and II's would still have the same
16 inerting/de-inerting requirements.

17 MS. DROUIN: Yes. But the thing I want to point
18 out on the Mark III's and the ice condensers -- we aren't
19 proposing in the risk alternative regulation that they have
20 to have back-up power.

21 What we're proposing is that, if station blackout
22 is a contributor, they have to deal with it, and so, they
23 have different ways they could deal with it.

24 They could either come back and show that station
25 blackout is not a concern, or if it a concern, their

1 containment isn't challenged, or they can come in and put
2 back-up power.

3 I mean it's open-ended. It's flexible in how they
4 can deal with it.

5 DR. KRESS: This is one place where you say you
6 would accept a very low frequency --

7 MR. KING: Yes.

8 MS. DROUIN: Yes.

9 DR. KRESS: -- even though it's just for a
10 specific sequence.

11 MR. KING: Yes.

12 MS. DROUIN: Yes.

13 DR. KRESS: You would sort of compromise
14 defense-in-depth a little for a specific sequence by
15 accepting very low frequency, as opposed to a high
16 conditional containment.

17 MS. DROUIN: I don't think that's compromising
18 defense-in-depth.

19 DR. KRESS: I don't think it is either, but some
20 people might think so.

21 MR. KING: It's the rationalist approach to
22 defense-in-depth.

23 DR. KRESS: Yes.

24 MS. DROUIN: Then the last thing, of course,
25 that's in the paper is the recommendation to proceed with

1 rulemaking immediately upon this.

2 I don't know, Tony, if you want to add anything in
3 that regard.

4 MR. MARKLEY: This is Tony Markley. I'm with NRR
5 in the rulemaking section.

6 Basically, once the paper comes back from the
7 Commission, what we would hope the Commission would tell us
8 is to proceed with rulemaking expeditiously.

9 Given all the work and everything that has gone
10 into this, we would expect to submit a schedule to the
11 Commission for the rulemaking effort and then proceed to
12 proposed rulemaking without doing a rulemaking plan.
13 There's certainly been a thorough evaluation of the issues
14 to this point to get us to proposed rulemaking.

15 Also, what we'd get back from the Commission is
16 basically the Commission's decision on 50.44 and going to
17 rulemaking, and that would provide us a basis for making a
18 decision on Mr. Christie's petition.

19 DR. KRESS: Did you want a letter from us on just
20 the 50.44 part?

21 MR. KING: We certainly would like something from
22 you on the 50.44 part, and if you want to say something on
23 the two policy issues, that's up to you.

24 DR. APOSTOLAKIS: But the thing that concerns me
25 is the -- what you call Attachment 1, "Framework for

1 Risk-Informed Changes to the Technical Requirements of 10
2 CFR 50, Revision 2."

3 Our letter on 50.44 necessarily has to say
4 something about that.

5 On the other hand, this is a document that you
6 told us earlier has already been updated. Rev. 2 is a
7 little old now.

8 MR. KING: There was a version that went to the
9 Commission back in April. What you have now is the next
10 update of that, and as we proceed, there will be even
11 further updates.

12 DR. APOSTOLAKIS: At which point do you expect
13 this framework to be final?

14 MR. KING: I would say probably -- we're working
15 on 50.46 now.

16 I'd say let us get through that, and then we'll
17 probably have enough experience to call it essentially a
18 final.

19 DR. APOSTOLAKIS: So, that would be in a year?

20 MR. KING: Probably no more than a year, maybe six
21 months, something like that.

22 DR. APOSTOLAKIS: So, is it possible, Tom, then,
23 to write a letter that comments on 50.44 --

24 DR. KRESS: I was having difficulty doing that,
25 yeah.

1 DR. APOSTOLAKIS: -- and say that, you know, the
2 elements that it is based on that come from the attachment
3 are reasonable but make sure not to explicitly endorse the
4 attachment either.

5 DR. KRESS: I think we'll have to go that way.

6 DR. APOSTOLAKIS: Something like that. We have to
7 rely on a master of the English language.

8 DR. SHACK: Maybe we can discuss that later.
9 We're running behind here.

10 DR. APOSTOLAKIS: We have to understand what they
11 want, too.

12 MR. KING: That's would be fine.

13 DR. WALLIS: I'd like to say something here.

14 I want to try to obey George's rule about opening
15 your mouth and saying things.

16 This is an example of risk-informed alternative,
17 right?

18 So, what I was hoping to see was a logical
19 explanation of how risk information influenced your decision
20 on these various categories of decision you had to make.

21 My impression is that Mr. Christie's opinion is
22 more important than the logical exposition of how you used
23 risk information --

24 MS. DROUIN: Absolutely not.

25 DR. WALLIS: -- because almost every slide, he is

1 cited, rather than some number which says this is the
2 criterion we used or this is how risk information was used
3 in our decision-making.

4 MS. DROUIN: As I explained, we added those
5 bullets on there so that you knew -- once we went through
6 and made our recommendation, which was done independent of
7 Mr. Christie's, and we looked at his petition, we were just
8 giving you information of where our risk-informed
9 alternative did or did not match up with his petition.

10 DR. WALLIS: Well, I'm not trying to be critical.
11 This is a risk-informed environment we're talking about.
12 So, that's the important aspect we ought to focus on, not
13 the opinion of one person.

14 I don't understand why this is given that
15 prominence.

16 MR. KING: The only reason it was put on there
17 was, one, we're into a situation now where we are in
18 petition for rulemaking.

19 DR. WALLIS: So, I'm really mentioning Mr.
20 Christie to contrast it with what I expected to find as the
21 emphasis of your presentation.

22 MR. KING: We tried to make your life easier by
23 putting it on our slides, basically.

24 DR. KRESS: Yeah, we're going to get involved in
25 discussing that petition.

1 MR. KING: Mr. Christie was one of many commenters
2 on this, and he didn't get any more or less weight than any
3 other commenters.

4 DR. WALLIS: But the risk-informed approach has
5 nothing to do with what someone's opinion is.

6 MR. KING: We put that on to make your life easier
7 in case you wanted to see how the two matched up.

8 DR. WALLIS: It has nothing to do with what
9 someone's comment is.

10 It's a logical process, and that's what I'm
11 looking for.

12 DR. SHACK: Well, the thing I got out of this was,
13 you know, you can do risk-informed regulation when you have
14 1150, 1560, and a whole bunch of other stuff to supply all
15 the technical information that you need in order to do this.

16 DR. KRESS: Yeah, that's what I got out of it.

17 DR. SHACK: This is one you can risk-inform,
18 because you understand the risk very well.

19 MS. DROUIN: You know, if we'd had the time, it
20 would have been very nice to go through and explain how we
21 came up through our risk-informed manner in applying the
22 framework.

23 I apologize, we did not have the time. We just
24 had time to give you the bottom line. That's what we did.

25 DR. KRESS: Yeah, I thought you did a pretty good

1 job of that in the document, in the attachment.

2 MS. DROUIN: There is a 100-page attachment that
3 goes into quite a bit of detail.

4 DR. BONACA: My sense would be that, by the time
5 we get 50.46 and we get close to endorsing a final approach,
6 it will be worthwhile to have a subcommittee meeting where
7 we can be walked through some of the examples, so that we
8 have a better understanding of how the logic works.

9 DR. APOSTOLAKIS: I would suggest that, on page 7
10 of the Commission paper, where you say, "Risk insights
11 associated with hydrogen generation and combustion have led
12 to the following conclusion" -- why don't you add those risk
13 considerations that led you to this?

14 I really like what Dr. Shack just said. Unless
15 you know that there is a hell of a lot of work behind this,
16 you could never really tell. You know, risk insights -- I
17 mean what does that mean? A couple of guys sat around the
18 table and thought about it?

19 MS. DROUIN: I lost your point.

20 DR. APOSTOLAKIS: You don't give credit to the
21 Office of Research.

22 MS. DROUIN: Oh.

23 DR. APOSTOLAKIS: I'm sorry, but you don't. By
24 just saying risk insights lead to the following, you don't
25 give them credit, and you know, Dr. Shack just said, you

1 know, you have 1150, you had the IPEs, you had this. I
2 would add a page or two, maybe a diagram from an event tree
3 or something. This is really important.

4 MR. KING: Okay. I understand your comment.

5 We're done.

6 DR. SHACK: We have two presenters from industry.

7 Mr. Heymer wants to talk on the benefit of NEI.

8 MR. HEYMER: Good morning. My name is Adrian
9 Heymer. I'm a project manager at NEI dealing with
10 risk-informed regulation.

11 I'm here to give you a brief, I guess, 15-minute
12 presentation on what we think -- or where we think we stand
13 as regards option 2 and option 3.

14 But before I do that, I'd just like to make a
15 request.

16 We've heard mention of two SECYs. There's
17 obviously a great interest in the industry in both those
18 SECYs.

19 There is a Commission briefing coming up on option
20 2, and we would like those SECYs released as soon as
21 possible so that we can be constructive in our comments as
22 we move forward.

23 We don't know what's in those SECYs. Obviously,
24 we've had a brief overview today, but I think it would be
25 good for the overall progression of risk-informed regulation

1 if we could move those things forward.

2 I did have some comments on what I heard today as
3 regards option 2, and I can get to those towards the end, if
4 necessary, of what I heard from the NRC staff on option 2.

5 I think there's some issues which the industry
6 sees as fairly significant associated with option 2.

7 I think it's important that we focus on the
8 safety-significant SSCs, and that presumes that we have some
9 confidence in the categorization process, and I think once
10 we've done that and we have some confidence in the
11 safety-significant SSC categorization process, there should
12 be less concern about how we're handling SSCs and activities
13 associated with low safety significance.

14 There has been significant -- and that's probably
15 on the weak side -- interaction between the industry, STP,
16 other utilities, and NEI and the NRC staff on what goes in
17 RISC-3. We've struggled to understand the NRC staff's
18 position on some of those issues in some cases.

19 DR. SHACK: You don't mean the categorization.
20 You mean the special treatment.

21 MR. HEYMER: The special treatment, yes. Thank
22 you. And I think we're still struggling.

23 I can understand, to a certain extent, why the
24 staff's there, and it's a change in emphasis, but we're a
25 little concerned about describing how to -- or how we're

1 going to implement activities in fairly significant detail,
2 as it appears to us at the moment, on SSCs that are of low
3 safety significance.

4 On the ASME standard and PRA certification, which
5 is central to the -- I guess may be central to the
6 categorization process, we believe a peer review is an
7 acceptable methodology to accept -- to assess the PRA
8 suitability associated with -- for the use in option 2, and
9 to that regard, we submitted that to the staff for their
10 review.

11 As you're well aware, there have been significant
12 NRC staff comments on the standard, and I'm glad to say that
13 the industry and the NRC staff will be sitting down to try
14 and sort out where we go with the standard next week, and I
15 understand that there's a public meeting on that next week
16 to try and see a way ahead of how we deal with the standard.

17 DR. POWERS: You've indicated that a peer review
18 is an acceptable methodology here.

19 Peer review is, of course, a widely used tool
20 within the scientific institution and probably has served
21 the scientific and engineering sciences well over the past,
22 but it is getting some reexamination in the more academic
23 areas.

24 I guess my question to you is, do you think that
25 the peer review you're talking about here is susceptible to

1 the kinds of difficulties that they have encountered with it
2 in areas like NSF and NIH?

3 MR. HEYMER: I'm not aware of those difficulties,
4 Dr. Powers, but what I will say is, if you get a group of
5 people together who are knowledgeable about the subject, who
6 are not directly linked to it, and they come in and they
7 review it and they provide you insights and input, I think
8 it's incumbent upon the utility that has done the PRA for
9 that specific unit to take action on those comments and move
10 forward, and perhaps we haven't made that clear. I think
11 that is our intent.

12 I mean I think the peer review is just one step,
13 it's one insight, and I think you need to follow up on what
14 did the peer review come out with and how am I dealing with
15 those issues, as we move forward.

16 DR. POWERS: You got the essence of where I was
17 going on this, was that there has to be more than just the
18 requirement for peer review.

19 There has to be followup on the findings and doing
20 something about it, so there's really two reviews, one the
21 peer review and then what did you do about it, as well.

22 MR. HEYMER: Yes.

23 So, I guess that is what I have got to say on
24 option 2.

25 There are some interactions scheduled with the

1 staff in a couple of weeks, and we look forward to reading
2 the SECY.

3 I'll try and make this as quick as possible in the
4 interest of time.

5 I think, as regards option 3, if you just sit back
6 and think about where we were 12 months ago, 15 months
7 ago, and where we are today, it is a significant step
8 forward.

9 We have interacted with the staff, and I think
10 there is an issue out there on option 3 as regards -- if
11 you're going to add additional requirements, that there
12 needs to be some form of assessment of what that burden is
13 going to entail, both as regards to cost as well as the
14 safety benefit.

15 The decision that the NRC has made -- and I think
16 it's come out pretty well as regards the recent presentation
17 just a few minutes ago -- is that the NRC decision should be
18 based on up-to-date technical analysis and information, and
19 I think, when you look at some of the material that's
20 associated with where the NRC has drawn its conclusions, it
21 may not be the most up to date, and in some cases, the
22 industry has some concerns about the technical basis.

23 The up-to-date issue, certainly as regards the PRA
24 and the IPE information, I think that's incumbent upon the
25 industry to make that information available. There is a

1 significant benefit to the industry to making sure that the
2 PRA information is available, that is up to date, is made
3 available to the NRC so that they can base their conclusions
4 and their discussions and their recommendations on the
5 latest information and data.

6 We're working within the industry, through the
7 Risk-Informed Regulatory Working Group, to try and achieve
8 that aim.

9 I think the debate at the moment centers around,
10 well, what do we give the staff, how much do we give them,
11 do we give them the complete PRA all the time, or do we give
12 them a summary of the assumptions or changes in the
13 assumptions, and a summary of the results, and that's what
14 we're struggling with at the moment, so that, one, it
15 doesn't present a burden on ourselves to submit a huge
16 amount of information which is going to present even more
17 burden on the NRC to look at and review, but rather, can we
18 narrow that down, and when we've got our own thoughts
19 together, I think we intend to come and talk with the NRC
20 staff to see how best we can facilitate that action.

21 But I think it's important to recognize that
22 aspect, and I think, as you go forward in the rulemaking
23 process, there needs to be some form of estimate.

24 I'm not going to say it's a cost-benefit or a
25 back-fit analysis, but there must be some form of estimate,

1 and in fact, I think the rulemaking process requires of that
2 that there needs to be an estimate of the benefit and the
3 burden on the licensee.

4 We did have some comments and some concerns about
5 the way the framework document was written, and talking with
6 the staff in some of our interactions, it is clear that
7 they've revised the document, and now I heard today that
8 there is a revision to the revision, and that's good. We do
9 recognize that as an evolving process.

10 I think they've made a good effort to try and link
11 it back to the sort of cornerstones to produce a document
12 that describes the overall framework of how they're going to
13 look at the technical requirements from a risk perspective.

14 DR. APOSTOLAKIS: Adrian, I have a question on the
15 previous slide.

16 You say that there should be an estimate of
17 licensee/NRC benefits and burden when new requirements are
18 about to be imposed.

19 Shouldn't the same thinking apply when
20 requirements are to be removed?

21 In other words, couldn't the NRC say, yeah, it's
22 unnecessary, but it doesn't cost you much, go ahead and do
23 it anyway?

24 Why would the cost or burden be important only
25 when we impose things? When we remove them, then we can do

1 the same thing.

2 MR. HEYMER: Well, I think if you're removing the
3 burden, even if it's not costing you very much, there's
4 still -- you come out on the plus side.

5 DR. POWERS: I've certainly heard people make this
6 argument that removing burdens ought to be subjected to some
7 benefit-burden analysis, and I guess I don't agree.

8 I think that, if we find regulations that are
9 imposing burden unnecessarily and we can remove them, that
10 it is the essence of good regulation to get rid of those
11 things.

12 DR. SHACK: The trick is when you have burden
13 reduction but some increase in risk.

14 DR. POWERS: I think that the -- again, the
15 essence of our approach here is that, if the incremental
16 risk is minuscule but removing burden, we're obligated under
17 our self-imposed standards of good regulation, to get rid of
18 those things, because the burden estimates that we tend to
19 make -- I think if we look at them historically, they are
20 under bounds, on the true burden, and there's no question
21 that they're a diversion of focus, just no question about
22 that.

23 DR. APOSTOLAKIS: It seems to me that the
24 Caesar's-wife saying applies here. You're going to do it
25 both ways. You have to do it both ways.

1 DR. WALLIS: Well, someone has to be looking at
2 the public benefits and burden.

3 MR. HEYMER: And I think the public benefit is
4 there by focusing on those aspects which have real safety
5 significance.

6 I think reducing both the economic and the
7 resource burden as regards manpower, what you're looking at,
8 so that you can focus -- you've got more people available to
9 focus on the important stuff --

10 DR. WALLIS: I think you have to keep saying that.
11 Otherwise, it gives the impression that it's just NRC and
12 the licensees having a debate on who gets the best benefit
13 and the least burden.

14 Somewhere in there the public is looking on and
15 saying what's in it for us?

16 MR. HEYMER: Well, yes, I think you're quite
17 right, Dr. Wallis.

18 DR. POWERS: I guess I will interject again and
19 say that I think it's the responsibility of the NRC to
20 uphold the public's interest in these things.

21 MR. HEYMER: Okay.

22 We would like to meet with the staff on 50.44 to
23 discuss some of the basis and some of the issues that are in
24 the technical document, certainly the technical document
25 that's associated with the ice condenser issue. I think

1 that will improve the process. It will get us off into a
2 much more sound footing.

3 We have some concerns about some of the analysis
4 and the assumptions that went into that analysis, and I
5 think it is important as we go through this process that, if
6 we're going to produce a document like that, that the
7 licensees at least get a chance to look at the assumptions
8 going into the study.

9 I'm not going to say you shouldn't do the study.
10 We're not saying that you shouldn't move forward and develop
11 a study and show us the results.

12 But I do think it's important that the assumptions
13 that go into the study need to reflect what's at the plant
14 and in the plant conditions, and we have some concern in
15 that regard.

16 So, that is why we would like to meet with the
17 staff.

18 I don't think it changes the outcome of their
19 recommendation, but I think if you have an NRC report out
20 there that perhaps has faulty assumptions going in and
21 doesn't have sound assumptions or sound results coming out,
22 that that's out there for somebody to use in the future, and
23 it may not necessarily have to be that way. So, that was
24 the real main point there.

25 On 50.46, we are working with the owners groups.

1 Each of the owners groups has got their own particular view
2 on 50.46, as do other people, and we're trying to coordinate
3 that effort to improve the efficiency of what we do and the
4 effectiveness of the regulatory process as we move through
5 50.46.

6 50.46 is a very large regulation, is a complex
7 regulation, and I think if we have too many people coming in
8 with different ideas to the staff, we're going to get lost.
9 So, I do think we are trying to focus that issue and to give
10 it some priority to help with the process of improving and
11 implementing --

12 DR. WALLIS: When you say it's a large regulation,
13 you mean it has a big effect.

14 MR. HEYMER: A big effect.

15 DR. WALLIS: The actual number of words in the
16 regulation is pretty short.

17 MR. HEYMER: Yes. It has a big effect.

18 DR. WALLIS: There's a lot of leverage.

19 MR. HEYMER: It's a complex regulation. Once you
20 get into it, you find that you're affecting a number of
21 other issues.

22 And we're also talking with the owners groups of
23 where do we go once we've defined the large-break LOCA, what
24 activities do we look at, and how are we going to manage
25 that from an industry perspective, which I think will help

1 the staff in moving forward.

2 That's really what I've got to say on the option 2
3 and option 3 activities.

4 I do want to make --

5 DR. WALLIS: Do you think that risk-informing
6 50.44 is helpful? Is there some benefit from this
7 risk-informing activity?

8 MR. HEYMER: Helpful in regards to has it enabled
9 us to work through a regulation that was reasonably
10 straightforward and set a process for doing so.

11 DR. WALLIS: Is industry going to buy into this
12 risk-informed activity now they've seen this example? Does
13 it help illustrate how it can be done and what the benefits
14 are?

15 MR. HEYMER: I think it's helped in sorting out
16 some of the problems that are associated with reviewing and
17 risk-inform the technical requirements.

18 I think when we look at 50.44 -- and we've still
19 got a few things to iron out, a few wrinkles to iron out,
20 but I think, overall, we're going to say yes, this process
21 came out as a positive experience and we can move forward.

22 There's certainly a lot more interest beginning to
23 develop in some of the other activities from the option 3
24 perspective as a result of where we're coming out on 50.44.

25 When I listened to the presentation that we just

1 heard from the staff on what their recommendations would be
2 on 50.44, I think we've almost converged and say yes, that's
3 about as far as we can do. We've set a process.

4 As I say, there still are some wrinkles that we
5 want to iron out with the staff associated with some of
6 their technical requirements or the technical basis for some
7 of their suggestions, but I don't think that changes the
8 outcome of the recommendation too much.

9 I heard some statements on option 2 as regards the
10 SECY, and I just want to emphasize that we did have a
11 concern in our comments on the SECY as regards option 2 --
12 that is, the ANPR -- about prescriptiveness in the rule, and
13 I do think I heard some comments and statements about the
14 Consumer's Power.

15 We haven't interacted with Consumer's Power on
16 that topic, but we do recognize there are other utilities
17 out there that might want to look at a different way of
18 implementing 50.69, and that's why favor a guideline
19 approach, we favor an endorsed NRC guideline approach that
20 if somebody else comes up with a different methodology, that
21 they could develop a guideline and present that to the staff
22 for endorsement, as we move forward.

23 If it's in the rule, it does make it a lot more
24 difficult to adjust things as we move forward, and the more
25 detail you put in the rule, the more restrictive and rigid

1 the process becomes, and that's not necessarily good as you
2 move forward.

3 I think our experiences with detailed prescriptive
4 regulation has not been good, and that's why we would
5 propose a guideline.

6 Part of that guideline, we believe, would include
7 something along the lines of a program summary associated
8 with commercial practices.

9 DR. SHACK: Thank you, Mr. Heymer.

10 Mr. Christie?

11 MR. CHRISTIE: Good morning. My name is Bob
12 Christie. I'm the owner of a firm, Performance Technology,
13 Knoxville, Tennessee.

14 Some background: I've been in nuclear power for
15 about 26 years now, and for the last 21 or so, 21, 22, I've
16 been involved in probabilistic risk assessment and all the
17 uses of it.

18 I've come today to give a quick summary of what we
19 had in interaction with the Nuclear Regulatory Commission,
20 ACRS staff on July 11th and 12th regarding combustible gas
21 control.

22 I'd like to do it with just one slide and give you
23 a briefing on where we stand with respect to the various
24 things.

25 There are four basic categories of things that are

1 going on in the industry with respect to combustible gas
2 control at this time.

3 I guess the first is the 10 CFR 50.12 exemption
4 request.

5 The first one of these was submitted by San Onofre
6 back in 1998, was approved in September 1999.

7 Oconee just submitted on back in July.

8 There may or may not be another one this week, and
9 there will be some more to follow.

10 So, the action is that utilities are submitting
11 50.12 exemption requests and will be doing so in the
12 immediate future.

13 How many, we don't know, and so on.

14 Petition for rulemaking -- as most of the ACRS
15 members know, I submitted a petition -- well, I didn't
16 submit a petition for rulemaking.

17 I submitted a letter to the NRC Commissioners on
18 October 7th, last year, after the San Onofre safety
19 evaluation report was approved, suggesting a lot of things,
20 one of which was changed to 10 CFR 50.44 to enhance safety.

21 The Commissioners turned it over to the Office of
22 Nuclear Reactor Regulation, who discussed with me making it
23 a petition for rulemaking.

24 We did make it a petition for rulemaking. It was
25 noticed in the Federal Register in January of this year.

1 The public comments have been submitted, and it is still a
2 petition for rulemaking.

3 It is not an option 3 petition for rulemaking. It
4 is a petition for rulemaking under the existing normal
5 practices of the NRC with respect to petitions for
6 rulemaking.

7 We've had a number of interactions with the ACRS
8 on this petition for rulemaking, including the meeting with
9 the subcommittee on June 29th, the meeting with the full
10 committee on July 12th.

11 There were a number of letters from myself to
12 members of the NRC staff which are defined here in a letter
13 to Mike Snodderly, July the 3rd, letter to Mr. Collins, July
14 the 14th, letter to Ms. Carpenter, July 20th. If you read
15 those letters, you can get definite understanding that we
16 are not very happy with the way the petition for rulemaking
17 has been treated.

18 With respect to the SECY option 3 framework, we've
19 had interaction with the staff, again back in June, July.
20 There have been a number of letters from myself to Dr.
21 Thadani, but I think we've finally cleared up in our own
22 minds what are the differences between what the -- what we
23 call the whole plant study from the industry has been trying
24 to accomplish versus option 3, and we now have, I think,
25 finally worked out the differences.

1 There are absolute differences between them. They
2 are major. We don't have the same objectives. We don't
3 have the same principles. We don't have the same
4 implementation plan.

5 So, it's definitely a different way of proceeding,
6 and hopefully I've explained it fairly well in the letters
7 that I've sent, and when we go into the next meeting on the
8 framework, we can go over it again if we have to.

9 As far as the option 3, 10 CFR 50.44, I notice
10 there's a lot of stuff on the slides about my position and
11 whether the NRC agrees with it or not.

12 I will have to wait to see the SECY and the
13 recommendations for rulemaking before I can say whether I
14 agree with them or not.

15 DR. WALLIS: Can I ask you, then, my question?

16 MR. CHRISTIE: Sure.

17 DR. WALLIS: Your petition asks that the reactor
18 containment withstand a hydrogen burn. That's what you
19 said, simply can withstand the hydrogen burn. What do you
20 mean by that?

21 MR. CHRISTIE: Okay.

22 If you look at the petition for rulemaking, for
23 the large drives --

24 DR. WALLIS: Do you mean by that that there's no
25 probability of failure?

1 MR. CHRISTIE: No. What we've said is that we
2 would look at the sequences that have a high probability of
3 causing core damage and we would look at the ability of the
4 containment to withstand the burn, and back in the -- and
5 what we meant in that sense was the work that we had done in
6 IDCOR, industry degraded core studies that were done back in
7 the '80s --

8 DR. WALLIS: I'm just looking for a definition of
9 what you mean by --

10 MR. CHRISTIE: That's what I'm trying to explain,
11 Dr. Wallis.

12 DR. WALLIS: Okay.

13 MR. CHRISTIE: We did a whole bunch of studies
14 back in the IDCOR to look at what was the containment
15 capability both from a design and an ultimate standpoint and
16 see whether or not we felt that the containments would
17 withstand the burns for the large dry containments.

18 DR. WALLIS: What does "withstand the burn" mean?

19 MR. CHRISTIE: No releases.

20 DR. WALLIS: No leakage.

21 MR. CHRISTIE: Yeah.

22 DR. WALLIS: Not a probability of 10 percent.

23 MR. CHRISTIE: No, not 10 percent.

24 For the large drives, we looked at can the large
25 drives containment for the sequences that have a fairly

1 decent probability of causing core damage -- can they
2 withstand it, and we looked at it in a sense --

3 DR. WALLIS: No failure of containment.

4 MR. CHRISTIE: Okay. We looked at it in the same
5 sense that we looked at the Three Mile Island Unit 2
6 accident.

7 We had containment failures at Three Mile Island
8 basically because we pumped water out of the sump back into
9 the aux building and so on and so forth, but the containment
10 withstood the burn.

11 It did not leak.

12 The burn occurred. It had a peak of about 28
13 gauge. The design was about 45 to 50. The ultimate is
14 probably anywhere between 130 to 150. It withstood the burn
15 in the sense there's no leakage, and that's what we meant
16 when we did that.

17 DR. WALLIS: So, yours is essentially
18 deterministic. You're saying it won't fail. Your
19 calculations indicate it won't fail.

20 MR. CHRISTIE: When you look at the calculations
21 that were done for IDCOR, no containment can be said to not
22 fail.

23 It has a probability of failure no matter what you
24 do, okay?

25 What we said was we believe, when we did all the

1 IDCOR analysis, that the probability of failures for the
2 hydrogen burns that would come from the sequences that had
3 some probability of occurring, you know, high-probability
4 sequences -- we can withstand it, and some of the people
5 went through the -- you know, uncertainty bands -- we went
6 through uncertainty bands. We went through the 95-percent
7 calculations.

8 We did things like -- they hydrogen burn at Three
9 Mile Island was probably somewhere in the neighborhood of 45
10 percent, 50 percent, metal-water reaction. We looked at
11 analysis for 75.

12 DR. WALLIS: All I want is -- it's a one-line
13 answer.

14 What do you mean by withstand the hydrogen burn?

15 MR. CHRISTIE: We do not believe the large dry
16 containments will have containment failures that will have a
17 significant impact on the public health risk during the
18 burns from core damage events.

19 It doesn't fail.

20 DR. WALLIS: Does not fail.

21 MR. CHRISTIE: We can't say it doesn't fail 100
22 percent of the time.

23 What we've said is we have uncertainty bands on
24 the failures, but we are pretty confident of the large
25 drives, and the Nuclear Regulatory Commission people put a

1 lot of effort into duplicating the IDCOR work.

2 They looked at it from the standpoint of
3 back-fitting requirements for igniters, and they also agreed
4 the large drives don't fail during hydrogen burns.

5 So, we don't have a requirement.

6 DR. WALLIS: I just don't think I've got the
7 answer I want, and I don't think I will get it, but I don't
8 want to pursue it anymore.

9 MR. CHRISTIE: You would have to look at the IDCOR
10 analysis to do that.

11 DR. WALLIS: I think there should be a one-line
12 answer to these questions, not a lot of equivocation.

13 MR. CHRISTIE: I was present during a lot of that
14 IDCOR work. I was present during a lot of the NRC work. I
15 don't think there's a one-line answer. There's people at
16 this time that also were there.

17 Okay.

18 So, as far as the agreement and disagreement with
19 what the staff thinks is going to happen in their option 3
20 and what we have in the petition for rulemaking, that's
21 neither here nor there, but I think -- well, okay.

22 Let me say, in summary, we can't -- we have known
23 for a year -- you're talking about the public interest and
24 who's worried about the public and how do we enhance safety
25 and how do we, you know, do this balancing act between the

1 elimination of the requirements and the cost-benefits and
2 all the rest of it.

3 We've known for a year, since San Onofre safety
4 evaluation report was put out, that the existing hydrogen
5 control requirements are detrimental -- they do not enhance
6 safety.

7 There are many things in those regulations which
8 we have, you know, submitted to the Nuclear Regulatory
9 Commission. They agree with us. They do not enhance
10 safety.

11 Safety would be enhanced by the removal of these,
12 okay?

13 That's the risk significance of the petition for
14 rulemaking that we did.

15 We wanted to enhance safety by elimination of
16 requirements.

17 We also wanted to enhance safety by additional
18 requirements along the rules of adequate protection in the
19 back-fit rule, and we did that.

20 For one year, we have had existing nuclear power
21 plants in the United States that are not as good as they
22 could have been if that petition for rulemaking had been
23 approved.

24 We're now going into, I guess -- and I haven't
25 seen the SECY -- an option 3 which is a voluntary program

1 for plants that want to get into this to improve it.

2 What happens to the rest of them who had the
3 petition for rulemaking under the old regime, and where do
4 they stand?

5 We wanted to enhance safety. We presented the
6 documentation. We went through all the task zeros for
7 Arkansas, San Onofre. We put the petition for rulemaking
8 in. We thought we had played the game according to the
9 rules, and nothing's happening.

10 Now, we're having to go back and submit exemption
11 requests again under 50.12.

12 It makes no sense to us.

13 I would have to say, beyond all shadow of a doubt,
14 the interaction we've had with the staff on 10 CFR 50.44 has
15 just flat increased the cynicism of the people at the plants
16 to the nth order.

17 They don't believe it anymore.

18 They hear words, "enhance safety," and all the
19 other things that people talk about.

20 When they had a concrete effort, devoted a lot of
21 resources to it, put a good faith effort to it, paid
22 attention to all the rules and regulations as they
23 understood it, and nothing has been done.

24 One plant in the United States is an exemption to
25 the requirements of 50.44.

1 Why not every plant?

2 Why are we sitting here today with something we
3 know the answer to -- we know the problem, we know the
4 answer, and it doesn't happen, and I have no message to tell
5 the people at the plant when they say why isn't the petition
6 for rulemaking done and why do we have to go about
7 submitting an exemption request?

8 I have no answer.

9 If you have an answer, I would certainly
10 appreciate it.

11 Thank you.

12 DR. POWERS: Do you have any concluding remarks,
13 Mr. Shack?

14 DR. SEALE: No, I think we're done.

15 DR. POWERS: Okay.

16 I am going to recess us for -- till 10 after the
17 hour.

18 I have adjusted the schedule so we will be late
19 for lunch and the starting of the last presentation, but
20 otherwise, we're going to go through this morning's agenda.
21 But we've just shifted it by roughly 45 minutes.

22 So, till 10 after.

23 [Recess.]

24 DR. POWERS: Come back into session, and I'll turn
25 to Professor Seale, and he will discuss the causes and

1 significance of design basis issues with us.

2 DR. SEALE: Well, I would remind the members of
3 the committee that, back when the Commission reorganized and
4 compressed its organization somewhat, the -- one of the
5 major results of that was the folding of the
6 responsibilities of the AEOD into, in part, NRR and also
7 with the balance to the research organizations.

8 And at the time, many members of this committee
9 expressed some concern for the loss of the independence that
10 was inherent in the former organizational structure and were
11 concerned somewhat for the future of the kinds of helpful
12 and incisive observations of the experience base that they
13 had been providing over the years to the Commission, and I
14 think most of us would agree, for the information that the
15 ACRS based many of its comments on.

16 Well, today, we're going to hear about an activity
17 that was begun back in those days, and as we do so, I want
18 to ask my colleagues to think carefully about the results
19 that are being performed, assess as best you can the extent
20 to which the chips are falling where they may, and also, and
21 ultimately, whether or not we're really getting the kind of
22 information out of this assessment of experience-based
23 results that can be useful to us as we go forward.

24 And I think this is particularly important at this
25 time, when we're in this transition toward risk-informed

1 regulation, that we keep our eye on what the -- what
2 experience is perhaps telling us the real currency of risk
3 is, what is it we're really concerned with, at least to this
4 point.

5 In view of the hour and so on, I won't try to go
6 into a lot more detail. I think the have a fairly complete
7 presentation here, but it's whether it's shades of the ghost
8 of Marley or Ed Jordan or who, we're going to hear about
9 this one, okay?

10 Gentlemen.

11 MR. LLOYD: Thank you very much.

12 I would say thank you. I think this is a good
13 opportunity to explain all this stuff, and being a kinder
14 and gentler committee out there, as I've seen from this
15 morning's activities, I'm sure that we'll be able to make up
16 a lot of time and get everybody out to lunch on schedule.

17 DR. POWERS: You don't need to worry about the
18 schedule. I made all the adjustments, and members need not
19 withhold any of their burning questions and in-depth
20 understanding here.

21 MR. LLOYD: Thank you.

22 As was mentioned, this study actually began in
23 early 1997.

24 It was at the request of our then-EDO, Ed Jordan.
25 Ed Jordan was there, and also Joe Cowan. This was a time

1 period when everybody was concerned about design basis
2 issues. Millstone was going on. Maine Yankee was another.
3 Crystal River was another, and so on. And so, there was a
4 time period, I think, when the agency was interested in what
5 the extent of design basis issues really meant, you know,
6 should we be worried about it, what is the risk significance
7 and so on, and so, we started out by making monthly reports
8 on -- 50.72 reports, as we got those.

9 As the time lag took care of itself, we got into
10 looking at 50.73, or LERs. There's only about a 90-day time
11 period between the time of issuance to the time that it
12 actually gets logged in through Oak Ridge and gets
13 evaluated, and so, there was that time space.

14 We had several of the old reactor analysis branch
15 in AEOD that would go through and review these LERs.

16 We set up a database to track all the various
17 kinds of pertinent facts, the type of the vendor, the age of
18 the vendor, how long the plant has been operating, what the
19 power levels were, what initiated the design basis issue to
20 be documented in the first place, what the AE background
21 was, what systems were affected by this design basis
22 problem, and there were several other things that we snuck
23 into that very specific AEOD database.

24 We also used the -- Oak Ridge's sequence coding
25 database, SCSS, and inputs from the region and NRR. There

1 were several other sources that were utilized to come up
2 with the study.

3 As time closed on '97 and we actually started
4 doing things, data reduction, in early -- about mid-1998,
5 and then things were added at the request of the regions or
6 NRR to the report, and it kind of moved around in that
7 scope, and eventually, it turned out the way it is as you've
8 seen it.

9 We went out for peer review on the report in May
10 of this year, 2000, and we hope to get a finalized version
11 of it by December of this year.

12 Next slide.

13 We looked at reporting trends from 1985 through
14 1997.

15 If you look at the total, there were approximately
16 3,100 design basis issues, or as we call them, DBIs, over
17 that 13-year period.

18 If you look at the trends, there was sort of a
19 general increase in the number of reported DBIs. It was
20 kind of based on the focus that the NRC had at the time in
21 the way of inspections or enforcement actions or generic
22 communications.

23 If you look specifically at 1997, there were
24 approximately 500 LERs that had design basis issues in
25 those. The total number of LERs that were produced at that

1 time for 1997 was over 1,900.

2 We've tried to look at what the risk might be, and
3 we tried different ways to evaluate risk of design basis
4 issues, and one of those was using the ASP program.

5 If you look at ASP trends that actually affected
6 design, it has varied over the last several years from as
7 high as 8 percent of the design basis issues that were
8 reported that were -- ended up meeting the threshold of ASP,
9 which would be 10 to the minus 6, conditional core damage
10 probability.

11 In 1997, the number of DBIs that met that ASP
12 threshold was less than 1 percent. So, there's been a
13 steady decrease in the risk significance based on the ASP
14 information that we have.

15 As far as reporting, number 5 at the bottom,
16 approximately 80 percent of the DBIs were reported by
17 licensees as un-analyzed conditions, and I think you will
18 hear probably more about that.

19 I think you've also heard some in the previous
20 topic discussion, also, about, you know, how you might look
21 at risk significance of these sorts of issues.

22 The next slide shows the long-term reporting trend
23 for DBIs.

24 As you can see here, going back to 1985, we had
25 just a little over 150.

1 We had kind of a slow increase in that period,
2 between there and '89, dropped off again by virtue of some
3 focus, Dr. Murley looking at how we should view design basis
4 issues, and then we had quite a large pick-up in '96 and
5 '97, and as I mentioned earlier, I believe that the main
6 increase in '96 and '97 were the result of the Millstone
7 inspections, Crystal River.

8 There was a 50.54(f) letter that went out in '96
9 requesting licensees to come forward with an design basis
10 problems that they might have with their programs and
11 whether they thought it was adequate or not and what they
12 should do about it.

13 There were also some generic communications that
14 came out of these same kinds of looks that also tended to
15 add to the number of design basis issues that were actually
16 reported.

17 The blackened area on the top of each one of those
18 graph points would be the contribution from the design basis
19 issues that actually met the ASP threshold.

20 So, as you can see, there's a small percentage of
21 DBIs that actually get issued that actually meet the ASP
22 threshold.

23 It had a high in the '90-'91 period, as you can
24 see there, of about 8 percent and dropped off to what we
25 have now in '97, which is less than 1 percent met the ASP

1 thresholds.

2 There were reasons for each of these.

3 If you look at the period '86 to '89, there were a
4 number of SSFIs done which had a significant design input in
5 those inspections.

6 We had -- through the '90 to '93 time period,
7 there were the SVs that went out.

8 Through the '93 to '95 time period, we had the
9 service water inspections, the SWOPes, that added a lot, and
10 then, of course, in the '96-'97 time period, we've got those
11 plants that were a significant focus in the design area by
12 the NRC.

13 DR. POWERS: Roughly that time period, they were
14 doing the functional fire inspection pilot program.

15 Were you getting design basis issues coming out of
16 that exercise?

17 MR. LLOYD: We got some, and it was interesting.
18 If we went back and we looked at the databases for the SVs
19 and the SWOPes and others, and then if you look at what was
20 actually produced in LERs or actually documented, in a lot
21 of cases, if it got documented in an inspection report some
22 place, it didn't necessarily get documented in an LER. So,
23 you can't really find a one-to-one correlation between the
24 inspection findings and some of the issues that actually get
25 reported in LERs.

1 DR. POWERS: What I was thinking of is, because
2 the functional fire inspection was just a pilot program,
3 only did four plants, you might have to do an extrapolation
4 in order to estimate what the whole population would be.

5 MR. LLOYD: Right.

6 DR. POWERS: I wonder if you thought any about
7 that.

8 MR. LLOYD: We didn't do that.

9 Later on, in some additional slides, we actually
10 took the Appendix R fire issues and also the seismic issues
11 and removed them from our risk-sorting process.

12 One of those reasons was because of what you said.

13 Another reason was because I'm not sure if we've
14 really decided what the risk significance is for some of the
15 postulated fires and also what the risk might be from the
16 seismic events.

17 So, you get quite a difference in opinion as to
18 where that risk really is.

19 DR. POWERS: You're saying that we don't have is
20 good risk assessment tools for fire.

21 MR. LLOYD: Exactly.

22 DR. POWERS: That's probably a familiar song this
23 committee has heard.

24 MR. LLOYD: Yeah.

25 DR. POWERS: Once or twice maybe.

1 DR. APOSTOLAKIS: One of the criticisms that the
2 recent UCS report on PRA has raised is that what the PRA
3 models is not necessarily what's in the plant.

4 Now, I get the impression from this presentation
5 that people find things, you know, design basis issues and
6 so on, and then there is an assessment or evaluation after
7 the fact as to how significant that finding was.

8 Were there any of these found when the facility
9 was doing a PRA? In other words, they looked because they
10 were about to do the PRA? Or is the PRA done on the basis
11 of the paper?

12 MR. LLOYD: I don't recall very many issues that
13 came out while they were doing the PRA.

14 There were a number of issues that actually got
15 reported as part of some of their design basis
16 reconstitution programs that they were either working on --
17 and of course, those varied a lot from just go find the
18 information to actually try to validate that the information
19 is correct.

20 So, there's a wide difference on what licensees
21 actually did in the way of restitution or reconstitution of
22 their design basis issue, but a lot of those issues came out
23 of those kinds of things.

24 A lot of issues came out of generic
25 communications, where we would send a communication out and

1 they would take a look to see if they had any problems, and
2 where they actually gave credit back to the NRC that said,
3 you know, while reviewing generic communication, you know, a
4 generic letter, a bulletin, whatever, you know, we found
5 this problem and now we're reporting it.

6 That got reported in our database, also. So, we
7 have those kinds of things.

8 And then there were the inspection issues that
9 came out that many times the LERs would give credit to the
10 NRC inspection that raised this issue and then they reported
11 it.

12 DR. BONACA: But I think, at least from my
13 experience from the mid-'80s, when we performed PRAs of some
14 of the northeast plants, not enough credit was given to PRA
15 in the sense that we raised an issue, electrical engineering
16 said, oh, the plant is not configured this way, that way,
17 and we said oh, so we changed it, we report it, but it was
18 reported as -- not necessarily as, you know, we were
19 verifying the PRA.

20 It was reported as electrical engineering found an
21 inconsistency or whatever.

22 So, I don't think PRAs were given, at least from
23 my experience, enough credit for the findings.

24 There were a lot of those findings that came from
25 the modeling effort.

1 MR. LLOYD: Right.

2 DR. POWERS: I think there's a more seminal issue
3 here.

4 I may be stealing a little bit of the thunder from
5 later in your presentation, and I apologize if I am, because
6 I think it's an important thing.

7 We do see this criticism coming down, especially
8 in Europe, on PRA that says, gee, the plants don't model
9 design errors, and clearly, they don't, because you don't
10 know about them, or you would, and it seems to me what
11 you're getting here -- you collected a database that said,
12 yeah, verily, there are a lot of design errors showing up in
13 these things and their risk significance is getting smaller,
14 and that means we're finding important ones, the ones that
15 are coming up now become less important, and I think, by
16 implication, says the fact that the PRA doesn't have this in
17 it is becoming less and less of an issue all the time.

18 If I was going to say what was the big bottom line
19 for me in the report, it was that.

20 MR. LLOYD: Yeah. I think that's probably a true
21 statement.

22 If you go farther back in time, when there were a
23 lot more latent design basis issues out there that licensees
24 just didn't know about -- so, in the 1980s, for example, you
25 know, there were probably thousands of things, you know,

1 spread out over the 100-and-some plants that were out there
2 at that time, that they didn't know they existed, and you
3 know, they thought their models were good, and their models
4 were probably pretty good, but they didn't know that the
5 plant didn't reflect the actual design.

6 DR. BONACA: I would like to add that, in large
7 part, also, is actually shows, in my sense, the strength of
8 the PRA, of the technology in some or many of these issues
9 which were identified as design basis issues, were not
10 design basis -- were not significant from a PRA standpoint.

11 For example, we found in the mid-'90s that a
12 number of plants had inadequate PSH in the circulation
13 systems, and what that meant was that, at the limit of the
14 assumptions for the recirculation, which means you have a
15 de-pressurized containment, which you are not likely to find
16 in many sequences, you know, under the most extreme
17 conditions, you may have, in fact, some cavitation of those
18 pumps.

19 The licensing basis assumes that you have a failed
20 system, because you have that happening. You defy your
21 design basis.

22 The PRA describes accurately the process of
23 performance of the recirculation system under all conditions
24 in a spectrum of LOCA.

25 Therefore, the PRA provides a much better

1 representation of the issue just for the modeling that it
2 provides.

3 The statement of not meeting the design basis is a
4 very narrow representation of the actual fault found, which
5 is under the extreme condition may not work.

6 MR. LLOYD: Right.

7 DR. BONACA: Okay.

8 So, you know, to me, one could argue that that's
9 really the strength of the PRA with respect to deterministic
10 determinations that allows it to give that kind of
11 representation.

12 Now, there may be cases where you have an actual
13 missing of the design commitment, and then that's a
14 misrepresentation in the PRA. I haven't seen many of those,
15 if ever.

16 MR. LLOYD: The next couple of slides, maybe some
17 of these things will come out, also. What we've got here on
18 slide number four, we went through and tried to mix the
19 deterministic side with the risk side, and we came up with
20 four different wickets that we went through and we did sorts
21 on each of the design basis issues.

22 We also presumed that each one of these would sort
23 of be in a hierarchical order. So if you look at the first
24 category, we looked at the risk category and we determined
25 that we had three slots that we could stick a DBI in. One

1 was potential, minimum and none.

2 Potential, in this respect, means that it would
3 meet the risk information matrix which was generated by
4 Brookhaven National Lab as being something that was
5 potentially risk-significant. Minimal meant that it was a
6 safety-related system, but necessarily didn't perform a
7 function that was rated highly as far as risk space goes.
8 And none was generally reserved for programmatic issues,
9 administrative issues, where a piece of paper was incomplete
10 and they just found the paper or they did an analysis and
11 there was never any problem.

12 So we would go through those three wickets there.

13 The next one that we went through was did you
14 actually have a safety demand and either a yes or a no.
15 Then you would go into a different cut-set.

16 You would look at effect type. Actual event was
17 something where a component or system did not work or did
18 not work to design expectations. Potentially, that was a
19 set of conditions or postulated things. So in this context,
20 nothing really did happen.

21 It was just some engineers sitting around saying,
22 well, okay, if we have this and we have that, well, then,
23 this system will not meet its design basis. So that would
24 be the effect type.

25 The effect extent is similar to what you mentioned

1 earlier here. We've got three categories there. You either
2 had a failed system, which means the system would not work
3 at all, or you had a degraded system, where the system
4 worked, but it didn't meet 100 percent of its design basis
5 criteria. Then the third and lowest in this grouping was
6 that you either had a degraded or a failed train, that you
7 had an additional train that would pick up whatever
8 requirements you had to mitigate an accident.

9 Degraded would be the same thing, that you had a
10 train that you actually turned it on and it didn't exactly
11 do everything it was supposed to in accordance with its
12 design requirements.

13 The next slide shows --

14 DR. APOSTOLAKIS: Help me understand something.
15 The accident sequence precursor program would pick up some
16 of these and do an analysis.

17 MR. LLOYD: Right.

18 DR. APOSTOLAKIS: So when you talk about DBI risk
19 category, you include the ASP?

20 MR. LLOYD: Right. Any event that met the
21 threshold of ASP, which would be ten-to-the-minus-six
22 conditional core damage probability, we also had another
23 slide in the report, I believe, that shows where those
24 actually showed up, and every one of those ended up in what
25 we call the group one section, which is on the next slide.

1 DR. APOSTOLAKIS: But what is the different
2 between potential risk category and ASP?

3 MR. LLOYD: If you were in a -- you would end up
4 being in the same place. If it were an ASP event that was
5 design basis related and through the analysis it said, yeah,
6 this meets the ASP threshold, it would also be a potential
7 event.

8 DR. APOSTOLAKIS: But would the potential event be
9 ASP, an ASP event?

10 MR. LLOYD: It could be.

11 DR. SEALE: It should be, shouldn't it?

12 DR. APOSTOLAKIS: Should be or could be?

13 MR. LLOYD: It could be.

14 DR. APOSTOLAKIS: It could be.

15 MR. LLOYD: Yes.

16 DR. SEALE: So all of the ASPs are the caps on
17 your previous bars, but all of the potentials are not in the
18 caps.

19 MR. LLOYD: Exactly.

20 DR. APOSTOLAKIS: Have we ever found a DBI that
21 led to a significant change in the CDF or LERF of a
22 particular plant?

23 MR. LLOYD: None of these have changed a lot, but
24 there's a couple more slides back that actually have those
25 values on it. The largest one, I think, was a

1 ten-to-the-minus-four. Most of those were smaller than
2 that. So there's not that big of an impact.

3 DR. APOSTOLAKIS: So we'll come back to this
4 later?

5 MR. LLOYD: Yes.

6 DR. APOSTOLAKIS: Okay.

7 MR. LLOYD: The next slide, number five, shows the
8 complete set of sequences that you would end up with after
9 you go through each of those four different wickets. So
10 you've got 19 possible end states.

11 The group one, as you can see from the upper
12 left-hand corner, up here, this would be group one and then
13 you had a group two, group two was anything that was either
14 minimal or no risk significance at all. Group one would
15 include those DBIs that had some potential to impact the
16 plant.

17 In 1997, there were 512 DBIs, 102 of those were
18 either fire or seismic. So we limited those. So you end up
19 with 410 left over for 1997. Out of that, in this category
20 two, there ended up being 13 DBIs. In the category three,
21 there ended up being 82 DBIs.

22 The bulk of the DBIs fell within the group two.
23 The largest was in category six, with 204; five, at 73; and
24 down at seven, which was no impact at all, there were 38 in
25 that group.

1 If you can kind of follow across, you can see what
2 the chart does. The top part of the chart is basically
3 identical to the bottom chart.

4 If you look at category 1A, for example, that
5 would be a potential, which means it would be risk
6 significant. It was on the rim. You had a safety demand,
7 so you had a yes. It was an actual failure, which means
8 that a component or system did not work when it was called
9 upon, and you actually had a system failure here. So that
10 would be a 1A category.

11 In all the ones that were reported during 1997,
12 there were no category one kinds of DBIs, because there was
13 no safety demand.

14 DR. APOSTOLAKIS: When you say actual failure,
15 what does that mean? It's a failure that's due to some
16 design deficiency, right?

17 MR. LLOYD: Yes. It would be a failure of a
18 system or component to actually work. So it actually was
19 turned on or it had to work. If it was instrumentation, the
20 instrumentation failed to work when it was supposed to work,
21 that would be an actual failure.

22 DR. APOSTOLAKIS: Right. But you --

23 MR. LLOYD: Potential failure would mean that
24 given certain postulated conditions, something might not
25 work. But you never had an event where it didn't work. It

1 was just postulated that it might not work.

2 DR. APOSTOLAKIS: But I thought we were looking --
3 maybe I misunderstood -- we were looking at design basis
4 issues. What does that mean? You can have random failures
5 of components. Is that the design basis issue?

6 So how do you decide that an actual failure is not
7 a random failure?

8 MR. LLOYD: What we're looking at here is the
9 design. First of all, you had to go through the wicket
10 that, yeah, it affected the design of the plant and there
11 were a bunch of events that got reported that we eliminated
12 because it didn't affect the design of the plant, even
13 though there was a failure.

14 Testing, for example, there were a whole lot of
15 testing issues.

16 DR. WALLIS: You said define -- it seems backwards
17 to me. It doesn't affect the design of the plant. It's the
18 design of the plant that affects the performance. You're
19 implying that it was the design of the plant.

20 MR. LLOYD: It had to effect the design of the
21 plant. So there had to be some problem with the design of
22 the plant, where then you had a --

23 DR. WALLIS: But this is a bifurcation. You're
24 implying something.

25 MR. LLOYD: The first wicket you had to go through

1 that you had to actually have a design problem and then that
2 problem was created by various kinds of mechanisms. It
3 could be that the pump was supposed to turn out 10,000 gpm,
4 but it only turned out 8,000 gpm.

5 DR. WALLIS: That could be because the
6 manufacturer made a lousy pump. That's not a design
7 problem.

8 DR. SEALE: Yes, but you picked it to do 10,000.

9 MR. LLOYD: There was a design requirement that
10 said it had to be 10,000 and all the analyses were based on
11 the fact that you could get 10,000 gpm out of that pump. If
12 they went down and actually had an event where they ran the
13 pump and they discovered that they only got 8,000 gpm out of
14 it, the pump still worked, it didn't fail. So you would be
15 in a degraded situation that affected the design, because
16 that pump did not meet the design requirement.

17 DR. WALLIS: That could be because something was
18 worn. It could have been okay at the beginning.

19 MR. LLOYD: There could have been all kinds of
20 reasons, but it failed to meet the design requirement.

21 MR. SIEBER: But the only place where you would
22 care and categorize them is if there was actually a design
23 error that said I applied the wrong pump to meet the
24 conditions of the system demand as opposed to a pump
25 degrading over time as --

1 DR. SHACK: Maintenance problem.

2 DR. SEALE: Maintenance or inspection.

3 MR. SIEBER: That could be reported as an LER, but
4 it wouldn't be classified as a design basis issue.

5 DR. APOSTOLAKIS: Is that what you did?

6 MR. LLOYD: We did what you're talking about here.
7 If there was a design requirement, using the pump issue, if
8 it was supposed to be 10,000 gpm and they actually went down
9 there and they ran the thing and under certain situations,
10 it only turned out 8,000 gpm.

11 First of all, it didn't meet the design
12 requirement. So there was a design problem. So it fell
13 short of whatever the analysis was for that particular pump.

14 DR. APOSTOLAKIS: Regardless of the cause.

15 MR. LLOYD: Right. If it didn't work, a lot of
16 times, the licensees would go through and sharpen their
17 pencils and say, yeah, it turns out less than the design
18 requirement, but we do analysis here and I think we're okay.

19 DR. BONACA: What if they went back and said,
20 okay, it delivered 10,000 when we bought it, has been
21 degrading beyond the degradation limit, and, therefore, it's
22 a wear issue. Now, that would still be considered design?

23 MR. LLOYD: It could be a wear issue. It could be

24 --

25 DR. BONACA: Assume that it was determined to be a

1 wear issue. Assume that.

2 DR. APOSTOLAKIS: It's still a design basis issue.

3 DR. BONACA: It would be still a design basis
4 issue.

5 MR. LLOYD: It's still a design basis issue,
6 because they don't meet the design basis requirement. But
7 it could be -- to answer part of your other question, it
8 could be a wear issue, it could be a system alignment
9 problem where alignments changed, and, at one time, with a
10 certain kind of alignment, with different sorts of valves
11 opened or closed, they may have been able to get 10,000 gpm
12 out of that thing.

13 But as changes were made here or there or maybe
14 system alignments, they only got 8,000 gpm.

15 DR. BONACA: But the point that Jack is making,
16 which is a good point, is that it will not be reported in
17 the LER as a design issue if it was a question of
18 maintenance, for instance.

19 MR. SIEBER: Well, everything in the plant
20 degrades.

21 DR. BONACA: That's right.

22 MR. SIEBER: With time, valves begin to leak,
23 pumps don't pump as much as they used to. So to me, all
24 those things should be maintenance issues.

25 DR. BONACA: Well, at least it would be important

1 that way. So if you read the LER, you may miss the DBI
2 issue, if there was one.

3 MR. SIEBER: The more important one is the place
4 where the designer misapplied a certain component.

5 MR. LLOYD: Right, if I got the wrong pump
6 installed.

7 DR. APOSTOLAKIS: I thought we were looking at
8 those, but now I think you are saying anything that does not
9 perform as expected --

10 MR. LLOYD: As designed.

11 DR. APOSTOLAKIS: -- is under this.

12 MR. LLOYD: Right. And this would be part of the
13 burden reduction, I think, that everybody is trying to
14 figure out and as far as reporting requirements go. A lot
15 of the things that are reported here, if you go and
16 wordsmith the thing and make some changes, would put the
17 licensee, if it was just strictly an issue where they didn't
18 meet the design because of some other sets of causes and if
19 that cause was maintenance or something else, well, then you
20 could not report this issue.

21 There are lots and lots of things that got
22 reported that really kind of spun up the licensees, I think,
23 to report a lot of things that were really of no
24 significance or consequence at all.

25 But by virtue of the reporting system that we've

1 got, if they had a pump that said here is my design
2 requirement of 10,000, it turns out 8,000, it doesn't meet
3 the design requirement, so the licensee has to fill out an
4 LER that says, hey, I've got a pump here that doesn't meet
5 its design basis, it's only turning out 8,000 gpm.

6 So I think there's a lot of places where things
7 could be improved and the reaction of the licensees could be
8 made by just changing some of the definitions of what should
9 be reported or what should not be reported.

10 DR. WALLIS: The remarkable thing to me is that
11 these keep being discovered, and in '97, at a very great
12 rate. This is a long time for this design error to lie
13 latent, undiscovered.

14 MR. LLOYD: Right, and never find it. That's
15 disturbed quite a few people and like I said, at the very
16 beginning, you've got the deterministic people on one side
17 that say, hey, we've got all these design basis requirements
18 and we've got defense-in-depth and I think that's working
19 for us, and you've got the risk people over on the other
20 side that says, well, so what if it works, it's of no
21 consequence in risk space.

22 It's very difficult to get those two groups
23 together and compromise.

24 DR. WALLIS: That should be like the example we
25 got from an unknown -- I won't mention the name -- a cable

1 which had not been connected for ten years and just suddenly
2 was -- that's typical design error.

3 MR. SIEBER: That's a construction error.

4 DR. WALLIS: But that would fit into your category
5 of design.

6 MR. SIEBER: We better try to move along, if we
7 can.

8 MR. LLOYD: Next slide. We've got various
9 observations. As I mentioned, these are all based on LER
10 reviews, Oak Ridge databases, the AEOD database, the ASP
11 database, the Reactor Program System database in NRR, which
12 has inspection effort and other kinds of things in it, and,
13 also, region input.

14 If we go on to the next one. We've got the
15 causes, was one of the things that we looked at, and here we
16 have approximately 72 percent show up as original design
17 error, which has been Dr. Wallis' comment.

18 A lot of these things have existed for 20 or 30
19 years and went through this entire time period and were not
20 discovered.

21 There may be more than one cause that gets
22 documented by the licensees and also Oak Ridge when they
23 document all these things. And this is why the percentages
24 don't add up to 100.

25 The next one is procedure deficiency,

1 approximately 28 percent of the DBIs attributed procedure
2 problems with how they got themselves in a condition that
3 would be outside of their design basis, and then human
4 error, just bad things happen and that's what the licensee
5 came up with.

6 DR. WALLIS: It's really all human error.

7 MR. LLOYD: A lot of that is all human error.

8 DR. WALLIS: Even the design error is human error.

9 MR. LLOYD: Right. The design error, the designer
10 made an initial error.

11 DR. APOSTOLAKIS: This 72 percent of original
12 design error, say some of them were there for 10-20 years, I
13 mean, why is that? How can we believe the PRAs if we find
14 things like that? What do we learn from this?

15 MR. LLOYD: That certainly comes up by the
16 opposition that would say that we had all these design
17 errors, they have existed for years. We've had testing
18 programs to go out and test systems and components to make
19 sure they're in compliance with the design, and then somehow
20 we miss them.

21 DR. BONACA: But the fundamental issue is what we
22 saw before in the chart, that very, very few were
23 significant. Why? Because most of them were, again, you
24 have MPSH that would work for most scenarios, except the
25 extreme limit, or you had, for example, screens for the sump

1 systems that had developed some opening somewhere, where you
2 could possibly entrain some debris.

3 So you had the situation where most of the cases
4 you had degraded components or functionality, but you had
5 functionality, which you were missing. It was the pedigree
6 portion of compliance that gives you -- which is required by
7 law.

8 So you had cases where you find piping that wasn't
9 fully qualified to the temperature for the circulation
10 system. The result of that was that several of these
11 reports, but the system would not be non-functional. It
12 would function as required; however, did not meet the
13 pedigree.

14 So most of these issues, that's why they have the
15 differentiation, large number or very few had safety
16 significance.

17 IN the modeling of the functionality, the PRA was
18 correct and very few of those had an impact on the PRA.

19 MR. LLOYD: You could look at why these issues
20 weren't discovered before and I think there's two or three
21 things that you can point to. One is the adequacy of
22 licensees' testing programs. A lot of the tech spec testing
23 requirements, if you go through them and really looked at
24 them, they may have been testing systems for years and the
25 nature of the test was such that you would not have found

1 the problem.

2 Like logic system functional testing, for example.
3 I was on an inspection down at Cooper and they had
4 discovered there were over 700 different tests that they had
5 were inadequate and would not have caught whether or not
6 things would have worked or not worked.

7 So a lot of that is the adequacy of the test
8 program. Some of it is just people missing things, not
9 testing the things they should test, and just nothing really
10 bad happened. And as we're seeing, the end result here is
11 that very few of these DBIs have a lot impact in risk space.

12 So we looked out there, too.

13 MR. SIEBER: I think another way to look at it is
14 you don't find most of these design basis issues unless you
15 actually look for them and that's where the SSFIs and the
16 SWOOPIES and so forth would do those.

17 You identify a lot of issues that will never turn
18 up in an acceptance test or a surveillance test or
19 post-maintenance test. Surveillance tests are designed to
20 make sure that you meet the tech spec. They do not test
21 every aspect of the design.

22 MR. LLOYD: Exactly.

23 MR. SIEBER: So the testing programs can't be
24 relied on as the ultimate mechanism for identifying all
25 these design issues.

1 DR. BONACA: Actually, the point you made about
2 the SSFI program was extremely effective. That's why you
3 see the decrease in the significant DBIs through the years,
4 although you increased the inspection so much in '97, you
5 found a lesser number of -- and that was because of the
6 SSFIs and the SWOOPIES, which were very effective.

7 MR. LLOYD: Right. They found a bunch of problems
8 initially and a lot of the big nuggets have already been
9 discovered.

10 DR. APOSTOLAKIS: In PRA space, it seems to me
11 there is a problem with the Bayesian updating of the failure
12 rates, because what people do is they start with a fairly
13 broad generic distribution and then they use test results,
14 specialized to update the distribution.

15 And it's a property of Bayes' theorem that you
16 don't need very many of those to end up with a very narrow
17 distribution, and I think what you're saying is that this is
18 not the right thing to do, because in cases where the test
19 does not -- is not a complete test.

20 MR. LLOYD: It's not a complete test.

21 DR. APOSTOLAKIS: So the high tail of the
22 distribution should not be moved or lowered, but it should
23 survive, which comes all the way back to the original
24 reactor safety study model, which I think was not quite
25 correct, saying that we will have broad distributions

1 because we want to cover all accident conditions.

2 There should be actually two distributions, one
3 for the severe accidents, which you may not be able to get
4 tests for, and then the other one, the true Bayesian
5 updating becomes very narrow.

6 And I think that's what you're telling us here.

7 MR. LLOYD: And I think some of these things
8 you're saying should be considered when you do those things.

9 DR. APOSTOLAKIS: I don't think anybody is looking
10 into it.

11 DR. BONACA: That's a very good point you're
12 making.

13 DR. APOSTOLAKIS: I made that ten years ago.

14 DR. BONACA: In particular, these problems of testing were
15 found in the safety systems, which are difficult to test,
16 because the standby systems never run and when you look at
17 some of the recirculation pumps, you recirculate back and on
18 a look that doesn't represent the actual physical
19 performance.

20 MR. LLOYD: Exactly.

21 DR. APOSTOLAKIS: But yet, if you do go to Bayes'
22 theorem, that high tail disappears in a second. So maybe
23 when next we speak to Mr. Cunningham.

24 DR. SEALE: Can we move along here?

25 MR. LLOYD: Yes, we need to move along. The slide

1 eight just shows the distribution of each of those. There
2 were a number of plants that had zero DBIs for the entire
3 year '97. The highest one was 37, that was Crystal River.

4 Engineering inspection hours varied a lot, as you
5 can see, from 90 to 3,700. And if you look at how fertile
6 the field might be at a particular facility, you can say
7 that the inspection hours per design basis issue ought to
8 tell you something.

9 If it's 15, you've only got 15 inspection hours in
10 for every single reported DBI that comes out, and we had a
11 plant like that. We had, at the other extreme, 630 hours of
12 inspection time and a lot of these -- in both places -- used
13 contractors of supposedly high experience and background in
14 order to pull that stuff out, and they still didn't find a
15 problem.

16 DR. SEALE: Could I ask you, when you say that
17 there was a certain number of hours per DBI, is that taking
18 all the DBIs and dividing them into all of the inspection
19 hours or only the inspection hours that were expended
20 looking into that particular issue?

21 MR. LLOYD: It's kind of a combination of the two.
22 We looked at just engineering and design inspections at a
23 particular facility and then the number of DBIs that came
24 out of that same facility.

25 DR. SEALE: Okay. So in some cases, if you were

1 really good, that is, if your plant was in good shape and in
2 general compliance, that tended to push you to the high
3 inspection hour number, which is not really a valid adverse
4 effect.

5 DR. WALLIS: On the other hand, there were 20
6 years of inspection hours which did not show up, some of
7 these DBIs.

8 DR. SEALE: That's right.

9 DR. WALLIS: So I'm not quite sure what to
10 conclude.

11 MR. LLOYD: The next slide shows where we divided
12 up the various DBIs and the systems that were affected. If
13 you included both the group one and group two DBIs, which
14 would be any design basis issue that got reported, whether
15 it was potentially risk significant or not, then you had
16 emergency core cooling and the AC/DC system would be the top
17 two contributors out of that.

18 If you only looked at those DBIs that had a
19 potential to affect risk at that plant, well, then the
20 distribution changes somewhat and you've got your emergency
21 core cooling at 34 percent, your AC/DC at 18, and then it
22 drops off after that.

23 The group one, as I mentioned before, is the
24 potentially risk significant. There were 95 of those that
25 occurred during '97. The group two, there were 315 of those

1 that occurred.

2 DR. APOSTOLAKIS: Why are you reporting
3 potentially risk significant? You haven't done the risk
4 evaluation yet?

5 MR. LLOYD: This was based on the Brookhaven Lab,
6 whether it was on the risk issue matrix, and then we --

7 DR. APOSTOLAKIS: Somehow we have to have a
8 resolution. Were they significant or not?

9 MR. LLOYD: We had 95. Out of that, there were
10 like just three that met the ASP threshold. So there's
11 quite a drop-off. So this would give you a conservative
12 estimate as to whether it was risk significant or not.

13 DR. APOSTOLAKIS: Do you plan to actually evaluate
14 the risk significance?

15 MR. LLOYD: We didn't, no.

16 DR. APOSTOLAKIS: Somebody else will?

17 MR. LLOYD: Right.

18 DR. BONACA: The figure three shows -- I'm sorry.
19 That's different.

20 MR. LLOYD: We did not. We grouped them
21 conservatively into these two groups based on Oak -- not Oak
22 Ridge, but Brookhaven group, and then we looked at that and
23 read through the design basis information as best we could
24 and then sometimes, even though it was on the rim, we looked
25 at the function and the problem that had actually occurred

1 and because of that, we eliminated that particular issue.

2 So it would be something less than what was
3 actually on the rim, but it would give you a conservative
4 amount. So you've got like 95 out of 500 issues or so that
5 you would actually have to maybe be concerned with and then
6 only a small fraction of that would actually get you into
7 the ten-to-the-minus-sixth or bigger.

8 DR. APOSTOLAKIS: My concern is that a statement
9 like this up there may not give a warm feeling to the
10 general public that we know what we're doing. Potentially
11 risk significant, I come back to Dr. Wallis' argument, what
12 do you mean numerically potentially risk significant and if
13 it's potential, why haven't you done it last night to find
14 out what it is.

15 MR. LLOYD: I think that's what we're really
16 trying to do in the inspection program today. If you've got
17 something that you've ran through the SEP process, you'd
18 like to get an SRA to look at it and see as quickly as
19 possible whether or not there's any real risk significance
20 standing there.

21 DR. APOSTOLAKIS: And they have the tools to do
22 that?

23 MR. LLOYD: In times past, people would write an
24 LER, even the Wolf Creek event, for example. It wasn't
25 until AEOD went down and looked at Wolf Creek that it was

1 determined that there was any significance there at all.
2 People wrote it off as not significant. The licensee wasn't
3 even going to report it, in fact.

4 So what we're trying to do is speed up this
5 process and I think we're heading in that direction with the
6 kind of program we have now.

7 DR. APOSTOLAKIS: Speaking of the AEOD, we have
8 seen a series of reports where they estimate
9 unavailabilities of trains and so on using information
10 pretty much the same as yours and they come up with numbers
11 that are within the PRA range.

12 So are we talking about the same body of
13 information here that the AEOD has already done the analysis
14 and they found the PRA is not off?

15 I mean, all these incidents, the DBIs that you
16 mentioned, are they also included in these AEOD analyses?
17 In which case I know that they are not risk significant. Or
18 are you doing something entirely different?

19 MR. LLOYD: I think they're already included.

20 DR. APOSTOLAKIS: They're already included.

21 MR. LLOYD: I think so. Next slide.

22 DR. APOSTOLAKIS: So we know the risk
23 significance. You don't need to go to the BNL tables.

24 DR. KRESS: I think that's the message Dana
25 brought up a while ago, that it's not a real risk

1 significance.

2 MR. LLOYD: It's not very risk significant.

3 DR. KRESS: So that this is an answer to the
4 critics who say you got all these problems not modeled in
5 the PRA. They are. They show up in some of the database of
6 availabilities and reliabilities.

7 DR. APOSTOLAKIS: The point is we have gone beyond
8 what the footnote says that these are potentially risk
9 significant, they have already been evaluated.

10 DR. KRESS: The potential is just a category that
11 came out of Brookhaven. It's just a name. You shouldn't
12 interpret it to mean it really is.

13 DR. APOSTOLAKIS: What I'm saying is we shouldn't
14 even be using those things.

15 DR. KRESS: I understand. I don't like the name
16 either.

17 DR. APOSTOLAKIS: Since we already have these
18 other kind of analyses, why go to the tables?

19 DR. KRESS: But it was the name they pulled out of
20 the Brookhaven report.

21 MR. LLOYD: The next one, slide ten, shows how the
22 breakdown would be by age, which was one of the things we
23 looked at. This is a standard age grouping.

24 If you look at the older plants, they showed up as
25 producing more design basis issues than the newer plants and

1 there's several reasons, I think, for that. One is just the
2 completeness of the design basis information, that at some
3 of the older plants, it's not nearly as good as the newer
4 plants.

5 The analysis techniques that were used back in the
6 '70s are different than the analysis techniques used in the
7 '80s and '90s. So that's probably the biggest reason for
8 those changes.

9 But nonetheless, the older plants are the ones
10 that tend to report more problems.

11 DR. KRESS: I have problems deciding whether those
12 numbers are significantly different.

13 DR. WALLIS: This is over what time span?

14 MR. LLOYD: This is just over this one year.

15 DR. WALLIS: One year, that's right.

16 MR. LLOYD: We went back in time and tried to
17 correlate with previous years and it appears to be very
18 little from year to year.

19 DR. SEALE: Very flat.

20 MR. LLOYD: It was very flat. So the production
21 of each of these is very similar to previous years, but this
22 was just done specifically for 1997. You would expect
23 essentially the same thing to occur at other ones.

24 The next slide shows the group one, which is this
25 potentially risk significant set of DBIs, and how that might

1 show up, and it combines age and whether or not you're at a
2 single-
3 unit facility or a multi-unit facility.

4 For each of the age brackets here, you've got more
5 design basis issues being reported at multi-unit facilities
6 than at single-unit facilities.

7 The reason being for that is largely the
8 connection between various systems that are either utilized
9 in both plants or it's a multi-unit site, some of the
10 interconnection. So you've got problems in addition to just
11 trying to resolve a single unit source of issues.

12 So in each case, whether you're an A group or a B
13 group or a C group, as far as age category goes, it was an
14 increase if you happen to be at a multi-unit facility.

15 Slide 12, we can just briefly go through this one,
16 since we've already talked about it. It goes along with the
17 ASP and how ASP relates to design basis issues.

18 If you go back to the 1990-91 time period,
19 approximately eight percent of the design basis issues met
20 the ASP. Today, it's less than one percent, it's like .6
21 percent met that.

22 The number of ASP DBI events went from 13 to three
23 over that time period, it's been a steady decrease.

24 The total number of ASP events from any kind of
25 initiator decreased from 28 to five.

1 So you could assume that the licensees are doing
2 better. You could assume that we've found the bigger
3 nuggets in the past and we're left with some of the smaller
4 design basis issues.

5 And a lot of the issues I think today are actually
6 discovered because of our analysis techniques are a lot
7 better today than what they were ten or 15 years ago.

8 So what might show up as, yeah, I can find this
9 very minute problem in my design, previous analysis
10 techniques, done ten, 15 years ago would not have discovered
11 that.

12 DR. APOSTOLAKIS: Again, just citing the proper
13 number of ASP events is not sufficient information, because
14 I may end up with one ASP event and feel happy and the
15 conditional core damage probability may be
16 ten-to-the-minus-two.

17 So can you give us an idea of what kinds of --

18 MR. LLOYD: Next slide, good lead-in.

19 DR. WALLIS: I just have a couple of facetious
20 questions. Were you asked to put a lot of numbers up to
21 please me?

22 DR. SEALE: It's just these guys talk about data.

23 MR. LLOYD: Slide 13 has all the important ASP
24 events on it for an eight-year time period. Important means
25 that it has a conditional core damage probability of

1 ten-to-the-minus-four or bigger.

2 So if you look at those, there were only three out
3 of the 14 that involved a design issue and all three of
4 those occurred at PWRs. So you can draw your own conclusion
5 on that. I think the density of the data is not really big
6 enough to say that PWRs are the ones that we should be
7 worrying about and we shouldn't worry about the B side.

8 DR. APOSTOLAKIS: Again, I don't think this is
9 complete information. For certain purposes, it's okay, but
10 if you worry about the quality of PRA and its fidelity, I
11 think you need an extra column showing the uncertainty that
12 the PRA estimated for the core damage frequency.

13 So then a number like 2.5-ten-to-the-minus-four
14 would be meaningful to me, because if the PRA had a
15 ten-to-the-minus-five, then I would really worry. But if it
16 was within the range, then I would say, well, gee, they
17 missed it, but, you know.

18 So if you could show something like that, I think
19 that would go a long way. Now, down there, I see a
20 three-ten-to-the-minus-three. That was at Wolf Creek.

21 DR. KRESS: That's conditional on the event.

22 MR. LLOYD: That's just conditional.

23 DR. APOSTOLAKIS: But at that time, that was the
24 frequency. So I'd like to know what the estimated range
25 was.

1 DR. KRESS: But you need another number, and
2 that's the conditional that the event would happen because
3 of this DBI.

4 DR. APOSTOLAKIS: I understand that, but in this
5 particular case, you are talking about the future. What I'm
6 concerned about is the criticism that the numbers that you
7 get now are not representative.

8 DR. KRESS: Yes, I understand.

9 DR. APOSTOLAKIS: So if I get a number that's
10 ten-to-the-minus-four and they show me
11 three-ten-to-the-minus-three, then it's not representative.

12 MR. LLOYD: This has been a compliant, I think, of
13 PRAs in the past, that you've got similar units and if their
14 baseline CDF is X and why is it so different at some other
15 place, and do they do the PRA different, is the model
16 different, is the level of information that you put into not
17 as good.

18 There's all sorts of assumptions that you would go
19 through.

20 DR. BONACA: The other thing I would like to add
21 is that the comforting issue and where you see the trend in
22 decreasing number of significant issues, that some of these
23 issues were not unique to the plant.

24 When you find MPSH issues on plants, other plants
25 very quietly reviewed it and found they had the same

1 problem.

2 MR. LLOYD: Right.

3 DR. BONACA: Now they've fixed that problem. So
4 what has happened is that some of these issues were generic
5 and where they were found significant by this common
6 experience, they have been resolved, and that's the reason
7 why you find less.

8 DR. KRESS: Don't those show up in an LER?

9 DR. BONACA: I'm sorry?

10 DR. KRESS: Wouldn't those show up in an LER? If
11 they found them, even though after the fact, they'd have to
12 write an LER on them and they would show up in here,
13 wouldn't they?

14 DR. BONACA: Would they show up in an LER that
15 way?

16 MR. LLOYD: They may or may not.

17 DR. BONACA: They may not. Because I know, for
18 example, the MPSH was found by many plants after we found it
19 at Haddam Neck.

20 MR. LLOYD: Haddam Neck, right.

21 DR. BONACA: And they were resolved. But now I
22 don't remember there were LERs. I don't know why.

23 DR. KRESS: I think what George is looking for is
24 some ammunition to use and I'm not sure we get it completely
25 out of this, but it looks like this has the potential to

1 give you that information and I guess you're looking for how
2 to take it further.

3 DR. APOSTOLAKIS: All I want to know is the guy
4 who did the PRA for the fourth row, for example, what kind
5 of distribution for the CDF did he report and then I would
6 look at the 2.1-ten-to-the-minus-four and get some idea, if
7 I do that for all of them, as to how good the PRAs have
8 been.

9 DR. BONACA: The uncertainty analysis should be
10 within -- sure.

11 DR. APOSTOLAKIS: They are.

12 MR. LLOYD: Good point. Next slide talks about --
13 we looked at regions and plants, once again, that had these
14 group one DBIs. Regions I and III had the highest
15 percentage of plants that had at least one DBI at 52 and 59
16 percent. Two and four were significantly less, 36 and 19.

17 DR. POWERS: Aren't these just highly correlated
18 with the age of the plants in the regions?

19 MR. LLOYD: Pardon?

20 DR. POWERS: Isn't this just highly correlated
21 with the age of the plants?

22 MR. LLOYD: I think it's highly correlated with
23 the age of the plants.

24 DR. SEALE: There might be a latitude effect here,
25 too.

1 DR. POWERS: I think that would be an unfortunate
2 conclusion because of the correlation effect here.

3 MR. LLOYD: This could be north versus south.

4 DR. KRESS: Clearly, Region IV is a much better
5 region.

6 DR. BONACA: You also reported in your report that
7 the more you look, the more you find.

8 MR. LLOYD: The more you look, the more you find.
9 And if you look at the number of inspection hours that
10 occurred in Regions I and III, you'll see a much higher
11 number than the number of inspections hours that you will
12 see in either of the southern regions.

13 So that would have an impact on it, also.

14 DR. POWERS: So you're telling me that the move
15 toward a more averaged inspection hours may not be a good
16 move.

17 MR. LLOYD: I think it's a good move.

18 DR. POWERS: You think it's a good move.

19 MR. LLOYD: I think it's a good move. If you
20 standardized who gets what and when, then you have a little
21 more normalization going on and you can decide whether or
22 not somebody is good or bad a lot better.

23 DR. APOSTOLAKIS: Maybe I missed it, but who
24 discovered this? Was it NRC inspectors or the plant people?

25 MR. LLOYD: These were plant people.

1 DR. APOSTOLAKIS: Plant people.

2 MR. LLOYD: Mostly plant people that discovered
3 these. A portion of those came because of us; i.e., we
4 turned out a generic letter or a bulletin somehow that made
5 the licensee go look and then they found a problem.

6 DR. APOSTOLAKIS: Right.

7 MR. LLOYD: In some places, we told them, in the
8 50.54(f) letter, to go out and do their design check and
9 when they did that, they found some problems. Some of these
10 were the result of NRC inspections, like the SWOOPIES and
11 things like that, where they went out and we found something
12 and the licensee picked it up and then subsequently reported
13 it. So there's a combination of all those things.

14 The next slide has to do with what we've already
15 mentioned here, the more you look, the more you find. We
16 did a correlation analysis between the number of issues
17 reported versus the number of hours that we actually
18 inspected, and it showed exactly that.

19 You go look more, you'll end up finding more. The
20 correlation coefficient on that, as shown in the report, was
21 .77. The P value was less than .01. And so that has an
22 impact on how you do your inspections.

23 You could go out to a Millstone, for example, and
24 inspect the living daylights out of them and certainly they
25 reported a lot of issues.

1 DR. APOSTOLAKIS: You haven't done this?

2 MR. LLOYD: And very little of this has ever
3 turned up as really safety significant.

4 DR. APOSTOLAKIS: The correlation analysis you did
5 was only on the NRC findings, not the plant findings.

6 MR. LLOYD: This includes all the findings,
7 whether they originated from us or the plant.

8 DR. KRESS: Number of findings and number of
9 inspection hours, total.

10 MR. LLOYD: It's here is how many inspection hours
11 we put in and then here's how many findings.

12 DR. SEALE: The LER comes from the utility.

13 MR. LLOYD: Right. The LER comes from the
14 utility.

15 DR. SEALE: Whatever may have motivated it.

16 DR. POWERS: I had a question. You used a linear
17 regression analysis and I don't fault that, but I notice a
18 lot of AEOD reports or -- I'm going to keep calling them
19 AEOD reports, regardless where you are. I'm still holding
20 out for an independent group here.

21 MR. LLOYD: No AEOD.

22 DR. POWERS: You used a linear correlation
23 analysis. I was surprised by that, because there's no
24 reason to think that there's a linearity between the number
25 of inspection hours and the number of findings. In fact,

1 you would probably --

2 DR. KRESS: That would trail off at the end.

3 DR. POWERS: You would probably expect some
4 non-linearity and whatnot. And I was wondering, as a
5 general process, do you have more sophisticated
6 correlational analyses than just linear regression available
7 to you?

8 MR. LLOYD: What was done here, we used the SAS
9 program, which I think is used lots of places in the NRC and
10 in the industry as an accepted program that does that kind
11 of analysis.

12 DR. KRESS: It has two or three correlations. I
13 think if you choose any of them here, you get about the same
14 correlation.

15 DR. POWERS: It seems to me that I would have --
16 my initial reaction to it was I would have done an analysis
17 to see if they came out with the same distributions, if they
18 were isometric distributions, and get rid of the hypothesis
19 of linearity on the thing.

20 And I just wondered if tools like that were
21 available to you, because I see so many linear correlations
22 coming out of these.

23 DR. KRESS: That does exist in the SAS program.

24 DR. POWERS: It does.

25 DR. KRESS: And I think if you used it, I don't

1 know if they did, that part of it, used it, you would find
2 out the same. You wouldn't have much reason to choose
3 another correlation over the linear, in this case.

4 But I think this correlation is a pretty high
5 correlation, actually.

6 MR. LLOYD: It's a very good correlation.

7 DR. KRESS: And I think it tells you something
8 about the LER process. Maybe it's deficient in some way or
9 other.

10 MR. LLOYD: The next slide shows something we've
11 been talking about here in between the lines as we've gone
12 through the presentation, number 16 shows the highest number
13 of DBIs over this eight-year period, shows the plants.

14 DR. POWERS: What's going on down at Crystal
15 River?

16 MR. LLOYD: Crystal River had 93. Then you go on
17 down to Millstone and you drop off. I had the cutoff down
18 there at Salem I, but it's interesting to look at the -- out
19 of all those DBIs at Crystal River 3, 93 of them, zero of
20 those tripped the ASP threshold.

21 For all the effort that we did at Millstone 3,
22 there were 55 DBIs that came out of that, none of those
23 tripped the ASP threshold. It's interesting to go find
24 these design problems, but at the same time, if there's no
25 real impact on risk, the question has to come out, you know

1 --

2 DR. KRESS: Why do it.

3 MR. LLOYD: -- why do we have to report these
4 kinds of things and couldn't we change the reporting system
5 to reflect the risk side of it and then get to the place
6 where we could reduce burden on not only the licensee by
7 having to report this stuff, but it's also a burden on the
8 agency, because we have to analyze it and try to figure out
9 what it means.

10 DR. POWERS: We could cut back Oak Ridge's budget
11 pretty good here.

12 DR. APOSTOLAKIS: I think in the name of
13 defense-in-depth, we should keep it.

14 DR. WALLIS: Whether it's risk significant or not,
15 it's the measure of performance versus regulation. It's
16 telling you something about whether the regulations actually
17 lead to better performance or not.

18 MR. LLOYD: Exactly. Right.

19 DR. WALLIS: That seems to be a wider message than
20 just risk significant.

21 MR. LLOYD: It is. Slide 17, we took a couple of
22 case studies, and this was one of them, and we just said,
23 well, you know, what has happened and our bottom line, I
24 guess, was that it takes, in many cases, several years to go
25 out and resolve and implement changes to go out and fix some

1 of the design problems.

2 Some of the more obvious ones that everybody has
3 seen, and that's the PWR containment sump strainer and the
4 BWR ECS strainer clogging issues.

5 And if you look at the next slide, the generic
6 communication that we have issued goes back to 1988 and that
7 didn't work and then we issued one in '89 and '90 and '92
8 and we just kept on issuing them, issue after issue after
9 issue, when they were very, very similar.

10 A lot of the same kinds of problems were
11 identified in all these different issues. It wouldn't have
12 been that difficult for a licensee to extrapolate and say,
13 well, you know, maybe we ought to do something here, or for
14 the agency to do the same thing. Why should we have to turn
15 out this many generic communications before we got the big
16 flick?

17 DR. POWERS: In defense of the licensee, if he is,
18 in fact, handling 6,000 pieces of communication coming in,
19 one, it doesn't say do something now on your particular
20 plant, doing extrapolation is difficult for him.

21 Yes, in abstract, it's easy. In the context of
22 all the other work he has to do, it's not so easy.

23 MR. LLOYD: I guess the overall conclusion that
24 you can sort of make on this, and it's problems we have to
25 resolve, because we are in transition going from a

1 defense-in-depth deterministic sort of a mode into more of a
2 risk mode as we deal with licensees, and it's hard to
3 convert the deterministic guy to the risk side and it's hard
4 to convert the risk side that the deterministic side has
5 some merit and benefit.

6 So we need to work on that. I think there's lots
7 of opportunities to reduce burden on licensees as far as
8 reporting goes. It would reduce burden on them and would,
9 at the same time, reduce burden on us. WE need to, I think,
10 focus our attention more on those DBIs that are truly risk
11 significant and the ones that aren't I think we could just
12 push to the wayside and move on.

13 Even though if you look at 1997, for example,
14 there were five ASP events, three of those ASP events were
15 design related. So, granted, there weren't very many design
16 related problems, but nonetheless, they still occupied 60
17 percent plus of the ASP events that got reported during that
18 year.

19 So there is an impact and a need to look at design
20 issues.

21 I think the oversight process, the reporting
22 requirements, the changes that are being made there, what to
23 do with Part 50 and other regulations that we've got will
24 certainly be of benefit in burden reduction and our
25 definitions of what design basis really is and what should

1 be included in that definition would help to resolve some of
2 these problems for the future.

3 That concludes our presentation. Thank you.

4 MR. LEITCH: Just one very specific comment, and I
5 only mention this because it's one of those 1997 five DBIs
6 that resulted in ASP.

7 The synopsis of the Maine Yankee issue talks about
8 reactor coolant. My recollection of that problem is it was
9 component cooling, not primary system, the system they
10 called primary component cooling.

11 I'm not sure if it's just the synopsis that's
12 wrong or if, in your calculation of the PRA number, that it
13 was analyzed improperly.

14 MR. LLOYD: I'm not sure. I'd have to look at it.

15 MR. LEITCH: What I'm saying is it's one of the
16 five and it's one of the three of the five that are involved
17 in the DBI. So it just may be interesting to go back and
18 look at that. It may just skew your statistics if the
19 conclusion is wrong.

20 MR. LLOYD: Okay. I'll check on that. Thank you.

21 DR. SEALE: Any other comments from any member of
22 the committee?

23 DR. POWERS: I would just comment again that on
24 the face of it, it looked to me like a pretty boring study,
25 turned out to have, I think, some real implications on how I

1 view the role of PRA.

2 And though you may conclude that not much was
3 found out of this, I think it provides some ammunition to
4 confront critics of the PRA methodology here.

5 So once again, we find that the AEOD scrutiny of
6 the database is proving value in supporting our move to
7 risk-informed regulation.

8 And I think one of our obligations in our research
9 report is to comment on how this change in organization has
10 affected or not affected our access to that kind of
11 information.

12 DR. SEALE: Yes. I think also that it's incumbent
13 upon us, when we have questions of this sort, to not slough
14 off the question and figure, well, there's not a place where
15 we could really find that out, because I think there is, if
16 we look hard enough.

17 These people are handling and looking at an awful
18 lot of data. They are giving us -- they are getting a lot
19 of insight and we are remiss if we don't seek that insight
20 and make sure we use it in the specific cases where it's
21 applicable to any recommendations we may formulate.

22 I'm sure that we'll come back to see you again
23 about other things and I surely hope you will not be
24 hesitant in coming back to see us when you have something
25 else like this to report, because it is extremely valuable.

1 As Dana said, the first impression or the first
2 move is to sort of say what's new, ho hum, but when you
3 really get into the details, as George did there in looking
4 at some of the specifics as to what all was included in
5 these packagings that you did and so on, there's a lot of
6 data there.

7 DR. APOSTOLAKIS: I think there is one piece of
8 analysis you have to do that would really be valuable to
9 this. When you show this at CCDP, show the distribution of
10 the CDF, that's not enough. For how long? That's important.
11 For how long did this CCDP exist, because if it was the
12 result of a random failure of something, then I don't think
13 the comparison is meaningful.

14 Random failures occur all the time. But if you
15 say, no, for the last five years, this is what it was, then
16 there is a problem with the PRA. So these two pieces of
17 information.

18 DR. SEALE: Well, again, I want to thank you very
19 much and I figure --

20 MR. LEITCH: Just one further question. I found
21 your report, pages 30 and 31, particularly insightful and
22 interesting. I was just wondering if there's some synopsis
23 of this report that's shared with the industry.

24 MR. LLOYD: The report was shared with industry.
25 We have very minor comments back. I think they supported

1 everything they saw in there. NEI came back and thought it
2 was good stuff.

3 MR. LEITCH: Thank you.

4 MR. LLOYD: And thought that it would help and
5 also moving from this deterministic side into more of a
6 risk-based side.

7 MR. LEITCH: Thank you.

8 DR. APOSTOLAKIS: It's a bad tradition, Mr.
9 Leitch, of AEOD reports not being ready by anybody except
10 AEOD. We have been complaining about it for a long time.

11 DR. SEALE: Mr. Chairman, I'll give it back to
12 you. Thanks again, fellows.

13 DR. POWERS: I think I'd toss it right back to
14 you, sir. We move on to the proposed final Regulatory Guide
15 10.93, endorsing NEI 9704, and the esteemed Professor Seale,
16 once again. We'll move through this expeditiously.

17 DR. SEALE: Okay. I'm going to just go ahead and
18 ask our presenters to present.

19 DR. APOSTOLAKIS: An experienced presenter does
20 not use all the viewgraphs.

21 MR. MAGRUDER: I'm Stuart Magruder from NRR, a
22 project manager there.

23 MR. BELL: And I'm Russell Bell, with NEI. I'm
24 working with Stu and others on the design basis guidance or
25 interpreting the design bases as it's defined in 10 CFR

1 50.2.

2 DR. APOSTOLAKIS: Why is it plural, bases?

3 MR. MAGRUDER: There's a lot of bases that the
4 plant is designed on. That's a good -- it's a matter of
5 semantics, it's a good question.

6 MR. BELL: Collectively, it's one design basis, I
7 suppose you could say.

8 DR. APOSTOLAKIS: Is this the first time the
9 committee is having a presentation from NEI and NRR at the
10 same time?

11 DR. KRESS: No. We've had them before.

12 DR. POWERS: This has actually become fairly
13 common in connection with the regulatory guides.

14 DR. BONACA: And you came here originally with
15 some disagreement, I remember.

16 MR. MAGRUDER: Yes. We briefed you last fall and
17 I'm happy to report that we have a positive outcome, I think
18 anyway. We'll find out.

19 Very briefly, the objective here was to develop
20 guidance to clarify many of the issues that were presented
21 in the last discussion, a lot of different ideas about what
22 design bases meant and when to report when you're outside
23 the design bases.

24 So I'll get to a little bit of discussion here
25 about background and why we did this, but the bottom line is

1 we have a final reg guide enforcing industry developed
2 guidance or joint staff and industry developed guidance, and
3 we're seeking your approval to publish that guidance.

4 DR. SEALE: So you want a letter from us.

5 MR. MAGRUDER: Yes, sir. For background
6 information, this is the definition that appears in 50.2.
7 It was put there in 1968, I believe. It's not been modified
8 since then and we are not proposing to modify the
9 definition. We're just proposing to clarify it in our
10 guidance what it means.

11 DR. APOSTOLAKIS: So plant configuration is not
12 part of the design basis.

13 MR. MAGRUDER: That's correct. Well, to the
14 extent that the plant is designed a certain way, but the
15 maintenance of that configuration or the control of the
16 configuration is not part of the design basis.

17 DR. APOSTOLAKIS: So it's part of the licensing
18 basis?

19 MR. MAGRUDER: Yes, I'd say so.

20 DR. APOSTOLAKIS: So if I take a pump and move it
21 one foot to the right, design basis is the same, as long as
22 it does the functions and everything.

23 MR. MAGRUDER: Yes, and we'll get to that.

24 DR. POWERS: Well, you have to go through a 50.59
25 assessment on that.

1 MR. MAGRUDER: You may have to.

2 DR. APOSTOLAKIS: But it is not covered --

3 DR. POWERS: You definitely have to go through it.
4 Now, whether you pass the 50.59 screen is the question.

5 MR. MAGRUDER: The screen, that's right. That's
6 right.

7 DR. APOSTOLAKIS: Move it by an inch.

8 DR. POWERS: If you move it by an inch, you still
9 have to go through a 50.59 screen.

10 DR. APOSTOLAKIS: But that has nothing to do with
11 the design basis. It's the licensing basis. I'm learning,
12 I'm learning. Some of these things are obvious to you guys.
13 Us academics are not too familiar with those things.

14 DR. BONACA: By moving it an inch, you may cause
15 an increase in temperature because you're close to a wall
16 that will --

17 DR. APOSTOLAKIS: I'm getting much more
18 information than I asked for.

19 DR. SEALE: But none of it is coming from our
20 presenter.

21 DR. POWERS: How about moving it an inch isn't
22 necessarily affecting its design basis?

23 MR. MAGRUDER: A little bit of background, again,
24 on the relevance, why we are talking about this. Obviously,
25 it's used in quite a few places in Part 50, as you see here.

1 I'll mention just a few of them. 50.59, it doesn't
2 currently exist in the regulation. However, the new
3 regulation which will become effective early next year, it
4 will be included in the discussion of which methods would be
5 subject to 50.59 changes.

6 And as was alluded to in their last presentation,
7 it currently exists in the reporting requirements, but it
8 will no longer exist when the rule is changed, when those
9 rules are changed.

10 And as was discussed, the new reporting rules are
11 based more on sort of risk significance, but mostly on the
12 functionality of systems.

13 Also, most licensees, I should say, find it useful
14 to define what's design basis for understanding degraded and
15 non-conforming conditions.

16 Much of this background information was discussed
17 in the last presentation, so unless there's any questions
18 about that, I'll just skip this slide.

19 As you're aware, the staff and NEI have worked for
20 several years to develop guidance on the definition or
21 clarification on the definition. We briefed the committee
22 last fall twice. The first time we briefed you, we were in
23 disagreement with the industry on a couple points.

24 I think the briefing actually served as an impetus
25 to resolve some of those differences and we came back in

1 November and proposed to publish a draft guide for comment,
2 which we did in -- well, after the Commission approved it,
3 we published it in April of this year.

4 As you can see, we got 11 comment letters, all
5 supportive of the effort.

6 MR. BELL: I'm just so impressed with the NRC's
7 graphics.

8 DR. POWERS: I find it remarkable that Region III
9 felt an obligation to send in a comment letter. Did you not
10 talk to the regions in developing your positions?

11 MR. MAGRUDER: No. As a matter of fact, I think
12 one of the reasons they chose to send in one was because
13 they had been actively participating.

14 DR. POWERS: I see.

15 DR. SEALE: As I recall, one of the Region III
16 people was pretty well involved in doing this process,
17 wasn't he?

18 MR. MAGRUDER: We've gotten input from various
19 people from the regions, but yes. We try to make sure that
20 we're grounded in reality and talk to the regions.

21 DR. POWERS: We'll certainly expect NEI
22 presentations in the future to live up to the standard
23 that's being set here.

24 MR. BELL: I'm not sure we can.

25 DR. APOSTOLAKIS: Your first bullet says that

1 defense-in-depth is an important aspect of principal design
2 criteria. You must have a definition of defense-in-depth
3 someplace.

4 MR. MAGRUDER: I think that can be found in the
5 research paper this morning.

6 DR. POWERS: The best answer you could possibly
7 give. Go on.

8 DR. SEALE: Keep going.

9 MR. MAGRUDER: The point here is we wanted to
10 clarify in the draft guide the guidance that NEI had and
11 just make it clear that defense-in-depth is kind of a higher
12 level idea than the specifics of the design of the plant.

13 DR. APOSTOLAKIS: Higher than what?

14 MR. MAGRUDER: It guides the detailed design of
15 the plant.

16 DR. APOSTOLAKIS: And NEI felt defense-in-depth
17 was not important?

18 MR. MAGRUDER: No. Actually, I think after we
19 discussed it, they agreed with us and we no longer have an
20 exception, but when we were reviewing their draft guidance
21 at the time, we just thought it was important to point this
22 out.

23 DR. APOSTOLAKIS: How can something that is not
24 well defined be important?

25 DR. SHACK: It's like a safety margin.

1 DR. APOSTOLAKIS: Oh, because we have another
2 example. I'm sorry.

3 DR. POWERS: I think if you look closely.

4 DR. APOSTOLAKIS: I think I'm listening to
5 Professor Wallis too much.

6 DR. POWERS: I think if you look closely to Mr.
7 Gidell's arguments, you will find out that, in fact, there
8 are parts of any system that you cannot define, where you
9 arrive at logical inconsistencies.

10 DR. APOSTOLAKIS: Boy, how can I object to that?

11 DR. POWERS: That's right. Please continue.

12 DR. APOSTOLAKIS: Because you know that that man
13 ended up being crazy.

14 DR. POWERS: Because he kept looking for a
15 definition of defense-in-depth.

16 MR. MAGRUDER: The second point there is a
17 clarification we put in the draft guide regarding the
18 relationship of design basis to the updated FSAR and we just
19 wanted to make sure that it was clear that -- two points,
20 actually.

21 One was that changes to design basis can occur for
22 various reasons, including licensees' initiated changes to
23 the plant, and the fact that we wanted to make sure that it
24 was clear that supporting design information is also
25 required to be in the FSAR, as discussed in 50.34.

1 Subsequently, as you will see, NEI updated their
2 guidance document and they've alleviated our concerns in
3 those two areas. So we're proposing no exceptions in our
4 final reg guide right now.

5 This slide, I just wanted to kind of
6 re-familiarize everyone with the major points of the
7 guidance document. These are kind of the crux of the issue
8 here, the design basis function definition and design basis
9 values.

10 It's more or less a rephrasing of the 50.2
11 definition. I'll just point out that design basis functions
12 are those that are necessary to comply with basically our
13 requirements or are relied on in the safety analyses, and
14 the values are those values, the important phrase there,
15 reference bounds for design to meet design basis functional
16 requirements. So that kind of puts a bound on which
17 functions and which values we're talking about.

18 DR. POWERS: My recollection of 50.2 is imperfect
19 on the exact language. Why did you feel a need to rephrase
20 it?

21 MR. MAGRUDER: It's not quite the same language
22 and there's been -- this is not a perfect solution, either.
23 I'm sure there will always be differences in interpretation,
24 but this is a little bit clearer, and the guidance document
25 actually provides quite a few examples from systems which

1 will hopefully help licensees and the staff understand
2 what's design basis information and what's supporting
3 information.

4 And we're already at the summary, which is that we
5 have reached a common understanding through many years of
6 meetings with NEI and their task force, comprised of many
7 utility representatives. The public comments support the
8 guidance and we are requesting a letter from the committee
9 to publish it.

10 DR. APOSTOLAKIS: I had a question -- go ahead.

11 MR. LEITCH: You indicate here that you're
12 endorsing NEI 9704 Appendix B. I guess I'm just curious.
13 What is the total content of 9704? Does it deal with issues
14 other than this or does that represent a remaining
15 difference of opinion? Just what is the total scope of
16 9704?

17 MR. BELL: It's worth explaining. Thanks. And by
18 the way, Mr. Chairman, I brought no slides, so I'll be
19 maximally expeditious. Had I had a slide, I might have
20 addressed this question on it.

21 DR. SEALE: Your reticence is duly noted.

22 MR. BELL: Appendix B is that portion of a larger
23 document 9704 that deals with interpreting the definition of
24 design bases. So Appendix B is where our interactions over
25 the last couple years have focused and it will be on that

1 appendix that the NRC endorsement covers.

2 The rest of the document is called design basis
3 program guidelines. It dates back to an old NUMARC
4 document, the NEI predecessor, back at a time when utilities
5 were reconstituting their design bases and establishing
6 programs for doing that, and NUMARC, at the time, produced a
7 document to help people -- to write guidance for folks who
8 wanted to reconstitute.

9 So there's a lot of programmatic information in
10 there, where to look for this type of information and so
11 forth.

12 And really none of that -- all that is still
13 useful guidance, we think, we're not retracting it, but it
14 is not on point with the question of the interpretation of
15 this term.

16 So our interactions have focused on that appendix,
17 the interpretation of the term.

18 We plan to revise it, issue a Revision 1 that
19 incorporates the revised Appendix B and we'll do that as
20 soon as all the T's are crossed and the I's dotted on the
21 appendix.

22 MR. MAGRUDER: Let me also point out, I skipped
23 over the background here, but in 1992, the Commission issued
24 a policy statement on design basis and endorsed, to some
25 extent, the 9012, the NUMARC 9012 document on design basis

1 reconstitution.

2 We didn't specifically endorse their discussion of
3 the definition of design basis, but the approach of
4 reconstituting the design basis the Commission endorsed.

5 DR. APOSTOLAKIS: Is that what you quote here, the
6 guidance outlines of framework to organize and correlate
7 nuclear power plant design basis information?

8 MR. MAGRUDER: Yes.

9 DR. APOSTOLAKIS: Then I read, on the next page,
10 objective, the staff's objective is to develop guidance that
11 provides a clearer understanding of what constitutes design
12 basis information. Correct?

13 MR. MAGRUDER: Correct.

14 DR. APOSTOLAKIS: So far I understand that we're
15 talking about facts. Then I go down to defense-in-depth.
16 These criteria provide part of the standard for judging the
17 adequacy of the plant's design basis.

18 Now, we're in a different domain here. Adequacy.
19 Why? I thought it was only information.

20 MR. MAGRUDER: I'm not sure.

21 DR. APOSTOLAKIS: That's from your document.

22 MR. MAGRUDER: I know. I'm not sure what your
23 question is.

24 DR. APOSTOLAKIS: The question, I thought, from
25 what the Commission said on your objectives, is to provide a

1 clearer understanding of what constitutes design basis
2 information.

3 MR. MAGRUDER: Correct.

4 DR. APOSTOLAKIS: Not to evaluate the adequacy of
5 that information.

6 MR. MAGRUDER: That's correct.

7 DR. POWERS: But the information that's part of
8 the material used for evaluating the adequacy.

9 DR. APOSTOLAKIS: But not here. This is not the
10 purpose of this guide, is it?

11 MR. MAGRUDER: No. The point was that
12 defense-in-depth -- and it's another attempt --

13 DR. APOSTOLAKIS: So this is warning you that in
14 the future --

15 MR. MAGRUDER: No. It's another attempt to define
16 what defense-in-depth is and we're not saying that licensees
17 need to go back and review what's in their design now.

18 DR. APOSTOLAKIS: I would be happy if you deleted
19 that sentence. I mean, you have a lot on defense-in-depth,
20 where it says these criteria provide part of the standard
21 for judging the adequacy, that seems to be out of place
22 here.

23 You're not judging anybody's adequacy.

24 DR. POWERS: But it is, the information that is
25 here is part of the judgment of the adequacy.

1 DR. APOSTOLAKIS: But this regulatory guide does not address
2 adequacy.

3 MR. MAGRUDER: No, it doesn't.

4 DR. APOSTOLAKIS: It just collates information.

5 MR. MAGRUDER: That's correct.

6 DR. APOSTOLAKIS: All of a sudden, adequacy is
7 thrown in there.

8 DR. POWERS: No, it's not thrown in there. You're
9 misreading it.

10 DR. APOSTOLAKIS: And my second question is why
11 didn't you use the definition that the Commission has given
12 to defense-in-depth?

13 MR. MAGRUDER: We're not attempting to change that
14 definition. All we're saying is that that definition should
15 be applied in evaluating design basis of the plant.

16 DR. APOSTOLAKIS: Why didn't you use that
17 definition then in the white paper?

18 MR. MAGRUDER: That's a good suggestion.

19 DR. APOSTOLAKIS: Am I the only one who is
20 misunderstanding this paragraph?

21 DR. KRESS: I thought the word --

22 DR. APOSTOLAKIS: It's 107, it's under B,
23 discussion, page 7. If you look at the objective, it says
24 clearer understanding of what constitutes design basis
25 information. A clearer understanding will help the staff

1 and the industry implement the regulations that use the
2 current design basis.

3 So I thought it was just the facts.

4 MR. MAGRUDER: Yes.

5 DR. APOSTOLAKIS: This is what it is. And at the
6 bottom of the page, these criteria provide part of the
7 standard for judging the adequacy of the plant's design
8 basis. Now, here or somewhere else.

9 MR. MAGRUDER: The criteria that we're referring
10 to is defense-in-depth, not --

11 DR. POWERS: I think that's not true. I think the
12 paragraph, the criteria they're speaking of, an earlier
13 sentence says the plant's principal design criteria.

14 MR. MAGRUDER: Okay. Thank you. Right, which are
15 based on defense-in-depth principles.

16 DR. SEALE: In this paragraph, it says especially
17 the general design criteria, and then the next sentence says
18 these criteria are required. And then these criteria
19 provide. So it's the GDC the criteria is referring to here,
20 I think.

21 DR. APOSTOLAKIS: You are referring to the GDC.

22 MR. MAGRUDER: Yes.

23 DR. APOSTOLAKIS: All right. If everyone thinks
24 that way, what the hell. The majority is always wrong.

25 MR. MAGRUDER: That was the intent. I apologize

1 for the --

2 DR. APOSTOLAKIS: But I still don't understand why
3 you don't use the Commission's white paper.

4 MR. MAGRUDER: That's a good suggestion.

5 DR. APOSTOLAKIS: Multiple barriers.

6 DR. POWERS: Because some of us would object, see.

7 DR. APOSTOLAKIS: No, no.

8 DR. SEALE: Anything else? Okay. I'm sure you
9 can expect to get a letter from us. Mr. Chairman, I'll give
10 it back to you.

11 DR. POWERS: Fine. Thank you, gentlemen. I
12 enjoyed the presentation and the reading that you provided,
13 and congratulate you for a hard won success here.

14 MR. MAGRUDER: Thank you.

15 MR. BELL: Thank you.

16 DR. POWERS: And look upon it as a chance where
17 we've collegially worked together to produce something that
18 I think, in the end, will benefit all concerned here.

19 DR. SEALE: Yes.

20 DR. POWERS: With that, I'm going to recess us
21 until 2:00, to resume the presentations.

22 [Whereupon, at 12:45 p.m., the meeting was
23 recessed, to reconvene this same day at 2:00 p.m.]

24

25

AFTERNOON SESSION

[2:00 p.m.]

DR. POWERS: Let's go back into session. We are now going to move to the subject for the future, which is the AP1000 standard plant design.

The esteemed Dr. Sly Kress will lead us through this discussion.

DR. KRESS: That's literally and true. This is a discussion of the AP1000. As most of you know, Westinghouse plans to increase the power of the AP600 up to 1000 megawatts electrical and to seek certification thereof.

The NRC review of this is planned to be done in three phases, which you'll hear about what those three are today, I'm pretty sure. The phase one part is already complete and I think we will hear more about what the phase one is and the results of the NRC review.

But essentially it was to -- the phase one was just to identify the review issues and identify the informational needs that NRC will need to make their review and estimate the resources and schedules.

But also as part of this phase one review, Westinghouse submitted what they called fundamental assumptions for the review. There were five of these and I think NRC might have added a sixth one. But I'm not sure, but I hope we hear what these five assumptions were at least

1 and what the staff -- what their initial response is to
2 them.

3 I'm not sure whether we'll get to that or not, but
4 with that, I will turn it over to the NRR staff. I don't
5 know who.

6 MR. GRIMES: Yes. I will introduce Jerry Wilson,
7 who is the Senior Standardization Policy Analyst in the
8 License Renewal and Standardization Branch.
9 My name is Chris Grimes, and I'm the Chief of the License
10 Renewal and Standardization Branch. And Dave Matthews will
11 be joining us as time permits.

12 Jerry is going to provide the briefing today and
13 respond to your questions.

14 MR. WILSON: Thank you, Chris and Dr. Kress. I
15 believe you all have a copy of the handouts. I'm going to
16 do an overview. If there is something particular the
17 committee would like to hear, feel free to interrupt me.

18 By way of background, in January this year, the
19 NRC certified the AP600. At that point in time, we felt
20 that we had finished with our design certification efforts.
21 It had been an effort starting in 1987. But unbeknownst to
22 us and as Dr. Kress said, Westinghouse was designing a 1000
23 megawatt version of their advanced passive design and were
24 thinking of seeking design certification.

25 But they wanted to know in advance what the scope

1 of a review of the 1000 megawatt version would be and what
2 it would cost them, and so they came in and asked for a
3 pre-application review.

4 Now, very quickly, what they are proposing to do
5 is increase the power, but minimize the changes to the AP600
6 design, and I have identified what I think are the major
7 changes to the design here in this slide.

8 But their goal is to minimize the changes in the
9 design, thereby minimizing the amount of review if they
10 chose to come in for design certification.

11 DR. KRESS: They're going to increase the fuel
12 length by two feet, is it?

13 MR. WILSON: Yes, that's correct. They are going
14 to their 14-foot length.

15 DR. KRESS: Have they had experience with a
16 14-foot fuel before?

17 MR. WILSON: Yes. It's been used in --

18 DR. SEALE: South Texas.

19 MR. WILSON: Thank you. That is my understanding.

20 DR. SEALE: The problem, though, is that they have
21 a seven percent increase in fuel assembly length and a 20
22 percent increase in the linear heat rating.

23 DR. KRESS: Which means they're going to put in
24 more enrichment.

25 MR. WILSON: I don't know that detail.

1 DR. KRESS: I don't know how you do that without

2 --

3 DR. SEALE: Well, whatever, they're going to have
4 to pull more heat out of the fuel.

5 DR. KRESS: Of course, yes.

6 DR. SEALE: And that's getting you back up into
7 the range of the forced circulation PWRs.

8 DR. KRESS: Of course, this will be part of the
9 later review. This is incidental.

10 DR. SEALE: I appreciate that.

11 DR. KRESS: This is incidental to this particular
12 review.

13 MR. WILSON: That's correct.

14 DR. WALLIS: The last slide, presumably, this also
15 goes along with changes in the core makeup tank sizes and
16 the water storage tank, injection water storage tank. All
17 of those other things, most presumably get bigger.

18 MR. WILSON: Yes, sir. As you recall, there was a
19 tank up on --

20 DR. WALLIS: All kinds of things get bigger.

21 MR. WILSON: -- top of containment and there was
22 an assumption that that was seven days --

23 DR. WALLIS: So many things get bigger besides
24 just the list you have here.

25 MR. WILSON: Yes. There's a lot of other things.

1 MR. LEITCH: I also notice, not on your slide, but
2 on the handout that we got previously, that hot leg
3 temperature is increasing from 600 to 615 degrees. Is there
4 experience operating -- I suppose it's Inconel 690 tubing at
5 615 degrees?

6 MR. WILSON: I don't know.

7 MR. LEITCH: That's just a curiosity. All those
8 questions will come later.

9 MR. WILSON: Yes.

10 DR. SEALE: Other people have had problems with
11 605, though.

12 MR. LEITCH: Yes. Yes. 615 seems a little --

13 DR. SEALE: Ambitious.

14 MR. LEITCH: -- on the high side, to me.

15 MR. WILSON: Earlier, Dr. Kress had mentioned
16 there were five assumptions that Westinghouse had made and
17 those form the basis for how they see the application going
18 forward. I've listed them here in this slide.

19 First of all, Westinghouse believes that
20 approximately 80 percent of the information that was
21 certified in AP600 could come forward and be part of the
22 AP1000 application with no change, except changing the name
23 from AP600 to AP1000, and, therefore, the staff would not
24 have to re-review that information.

25 DR. POWERS: My suspicion is that if I went

1 through and did a count, and I haven't, that 80 percent is
2 about right, but if I weighed it for the areas that provoke
3 some controversy and took some substantial amount of
4 discussion, I wouldn't come up with the same percentage.

5 MR. WILSON: You're correct. That 80 percent is
6 volume of the application. Also, Westinghouse believes that
7 the testing that they did for AP600 would be sufficient to
8 support an application for AP1000, so that there would be no
9 need for further testing.

10 DR. KRESS: Now, when they say that, do they --
11 they don't imply that their scaling analysis is still valid,
12 do they? It's not part of that. That's not an implication
13 of that.

14 MR. WILSON: No. That they would have to provide
15 -- and we addressed that in our letter back and they've also
16 acknowledged that, that they are going to have to do further
17 scaling to demonstrate that.

18 Also, they plan to use the analytical codes from
19 AP600, with minor modifications for the AP1000 review. They
20 claim that a portion of the level one PRA would not have to
21 be redone, and they want to defer selective design
22 activities.

23 And what this gets at is that when we did the
24 AP600 review, Westinghouse did the structural design,
25 seismic analysis, and piping design. What they're proposing

1 for the AP1000 is to use design acceptance criteria for
2 those three areas rather than actual design information.

3 Now, this is a policy matter. As some members
4 know, the Commission allowed use of design acceptance
5 criteria in certain areas for the ABWR and System 80+ and
6 AP600 designs, but this is breaking new ground and the staff
7 ought to look at that and we would make a recommendation to
8 the Commission on that and the Commission would have to
9 decide.

10 DR. KRESS: I think from the standpoint of the
11 ACRS, that we probably ought to focus on the second, third
12 and fourth bullets up there.

13 MR. WILSON: Let me get back to that point a
14 little bit later in the presentation.

15 And, finally, Westinghouse had said that they plan
16 to use the same codes and standards for AP600, for AP1000 as
17 they did for AP600, with some limited exceptions that they
18 would notify us about.

19 And with that, Westinghouse came in and met with
20 the staff and asked for a pre-application review to
21 determine scope and cost. Now, this is not a typical
22 pre-application review assessment the staff has done in the
23 past. Normally, when we say pre-application review, we have
24 an application in hand and the staff is making a
25 determination as to whether it's sufficiently complete to

1 proceed to the actual review.

2 In this particular case, Westinghouse is asking
3 us, well, if we did do the review, what would it cost us,
4 what would be the scope of that review.

5 So this is much different. It's the first time,
6 to my recollection, we've done something like that.

7 So we agreed, Mr. Collins, the Director of NRR,
8 agreed to proceed in kind of a two-step process, which, by
9 the way, Westinghouse will be billed for this effort. So
10 Westinghouse requested to start phase one on May 4 and then
11 on May 31, they sent in a letter identifying the issues that
12 they think need to be evaluated to make this determination
13 as to what the scope of an actual review would be, and those
14 are the issues we just went through.

15 And then, a surprise, as you mentioned, the ACRS
16 sent a letter on phase one. I want to thank the committee
17 for that. In my 25 years here at the NRC, it's the first
18 time I've received a letter on one of my projects without
19 asking. Always something new.

20 DR. SEALE: It shows interest and concern.

21 MR. WILSON: Thank you very much. And the staff
22 reviewed Westinghouse's letter and the ACRS letter and we
23 sent back our results of the phase one effort in a letter
24 dated July 27, which I believe the committee has seen, where
25 we addressed those issues, the information we believe we

1 need in order to evaluate those issues, and estimates of
2 staff effort to evaluate those issues.

3 And I will say right now it was very difficult and
4 you should understand there's a lot of uncertainty with
5 those estimates.

6 The staff is good at identifying safety issues and
7 evaluating safety issues, but we're not very good at
8 estimating how much effort it will take to resolve them. So
9 it's just an estimate.

10 In that letter, we told Westinghouse that if we're
11 going to proceed to phase two, you need to let us know,
12 first of all, and, second of all, you need to provide us the
13 information to prioritize that effort.

14 Our situation is that the pre-application review
15 is not budgeted in our budget and if we decide to add this
16 work on, we're going to have to do some prioritization
17 effort.

18 So Westinghouse has just sent in a letter, it's
19 dated yesterday, and they've asked us to proceed with phase
20 two and they have identified the issues that they have
21 decided to proceed with.

22 So as you may recall from the NRC's letter, we
23 provided estimates in a rather detailed breakdown, with the
24 idea being that it's a menu and Westinghouse can decide on
25 which issues they wish to proceed on.

1 So what Westinghouse has told us is that they want
2 to proceed on codes and testing, as you might imagine, this
3 is not an important issue in terms of the scope of review,
4 but long lead time, depending on the outcome.

5 They also want us to proceed on this issue of
6 getting okay on use of design acceptance criteria rather
7 than detailed design information in the areas of piping,
8 structural design and seismic analysis. And, finally, this
9 issue that I referred to in the letter as exemptions, which
10 primarily deals with the use of the same codes on AP1000
11 that we used in AP600.

12 So those are the four areas that Westinghouse has
13 asked us to proceed with.

14 DR. KRESS: It's interesting they left off the
15 PRA.

16 MR. WILSON: Well, in the PRA, they were only
17 making the claim that a portion of it could be used. They
18 acknowledged that parts of level one would have to be
19 requantified and all of level two would have to be redone,
20 and so the gain was rather small and from the staff's
21 perspective, what we would have to go through to come to
22 agreement was a significant effort.

23 So from my perspective, it wasn't cost beneficial
24 to investigate this area. So I would see the whole PRA
25 review being deferred to phase three.

1 DR. KRESS: I see.

2 MR. WILSON: That's what I think will happen. On
3 the first item, on the actual volume of the application,
4 Westinghouse is still interested in getting agreement on
5 that, but for cost reasons, they are going to defer that
6 till later on.

7 So the question is now before NRR and the
8 executive team in NRR will be meeting here in the near
9 future and making a determination as to whether we can add
10 this to our workload.

11 What does that mean to ACRS? Well, if they decide
12 to proceed and do phase two in fiscal year 2001, staff would
13 initiate its review, notify the ACRS that we are doing that,
14 and make a request for both a subcommittee and a full
15 committee meeting with ACRS. We would want ACRS' views on
16 our results or, more specifically, our conclusions on these
17 four issues.

18 Our intent is to also seek agreement with the
19 Commission before we officially respond to Westinghouse.
20 Once again, this is all based on an assumption if we
21 proceed, and that's going to be determined and it's going to
22 be determined on our budget and priorities of our workload.

23 And if we proceed and answer those questions, then
24 Westinghouse will make a determination as to whether they
25 will actually come in with a design certification

1 application.

2 DR. KRESS: At this point, you haven't established
3 a position on these four issue assumptions. You've just
4 told them what information you think you need in order to
5 make that assessment.

6 MR. WILSON: I would say that we agree that these
7 are the appropriate issues.

8 DR. KRESS: You agree that those are the
9 appropriate issues.

10 MR. WILSON: Issues that need to be evaluated to
11 determine the scope.

12 And with that, I'm available for questions.

13 DR. SEALE: As I recall, that letter, there were
14 some comments with regard to the containment that was in the
15 letter we sent to you, but I guess that's later down the
16 road that they want to get into that.

17 MR. WILSON: That's correct. We reviewed your
18 letter and we felt that the issues identified by
19 Westinghouse were sufficient to make the phase two
20 determination. One of the items that ACRS identified, I
21 don't think there's any dispute with either Westinghouse or
22 the staff that these need to be evaluated, but many of them
23 would come up in the actual design certification review.

24 And I would note, and I know the committee hasn't
25 had a chance to see this letter, because it just came in the

1 door, but I've skimmed it and in the letter, Westinghouse
2 identifies the --addresses the items that ACRS has
3 identified and states which phase of the review they plan to
4 address those issues.

5 DR. SEALE: There is one aspect that troubles me
6 and that is that the implication is, in the way that it's
7 phrased, that somehow you are committing yourself to a
8 position on some pretty crucial questions, particularly the
9 adequacy of the current test base, before we go through and
10 do the full examination of what the design is going to look
11 like.

12 And certainly some of the problems we had with the
13 600 megawatt containment shell are in spades when you go to
14 1000. It's bigger, the concerns about stratification and
15 those other things are at least as serious and perhaps more,
16 and so I guess my concern is any commitment like that is a
17 tentative one only and I assume everybody understands that.

18 MR. WILSON: Yes. I share your concerns. I
19 believe the staff recognizes it's going to be a difficult
20 evaluation. It's an important one, from Westinghouse's
21 perspective, though, and so --

22 DR. SEALE: Sure.

23 MR. WILSON: So the staff is assuming that, if
24 workload permits us to proceed, we're going to look
25 carefully at this. And while this hasn't been determined by

1 the staff, I suspect that we would have some sort of a
2 qualification.

3 But in order to address Westinghouse's request,
4 we, both the staff and ACRS, should try to give the best
5 answer we can given the information they provide and based
6 on that, if new information surfaces that Westinghouse
7 didn't provide us in phase two that we learn during the
8 actual review, well, then that reopens the question.

9 DR. SEALE: Okay.

10 MR. WILSON: I think that's how you have to couch
11 it.

12 DR. BONACA: In the past, Westinghouse and also
13 the other vendors went through this kind of upgrades of
14 power plants, comprehensive changes for the existing plants.
15 They went from certain designs to an expanded design.

16 Are you looking at ones that went through those
17 changes? I remember, at that time, they identified, the NRC
18 identified the most important issues that were being raised
19 by changing the size and the power out of the plant.

20 I would expect a lot of those kind of inputs or
21 assessments would be applicable to this effort. Am I
22 correct? There's a lot of history behind power -- upgrades
23 of power plants.

24 MR. WILSON: Yes, but the power up-rates I'm
25 familiar with are --

1 DR. BONACA: Well, I'm not talking about rates.
2 I'm talking about where you're changing really the design
3 here, going from 600 megawatt electric, which is the
4 original design that Westinghouse use to have, for example,
5 for Connecticut Yankee, to a Seabrook design that is 1100.
6 There was an item by item comparison being made of all those
7 issues and which ones -- experience put out which ones were
8 the most important or the ones that were missed and were
9 very important.

10 MR. GRIMES: Dr. Bonaca, I will try to address
11 that, because I recall that time. I would argue that the
12 process that we went through when we made the transition
13 from what we now call the middle aged plants to the newer
14 vintages was basically the same process that Jerry described
15 that we've gone through here in terms of reflecting on the
16 most recent technology that we have in the AP600 safety
17 evaluation and how we would extrapolate that knowledge base.

18 In those days, what we did was we reflected on the
19 strength of the standard review plan that was relatively new
20 at that time and we determined whether or not we were
21 comfortable that we had the right standard review plan
22 approach for the larger newer plants.

23 DR. BONACA: I just was asking if that review that
24 you're quoting now would in any way help to look at this
25 right now, to understand what are the areas where you should

1 focus the most.

2 MR. GRIMES: If there was some kind of checklist
3 or record that explained the logic that we went through to
4 review the standard review plan, unfortunately, I've
5 discovered that we spend more time going back trying to find
6 the records than we do resurrecting the corporate knowledge,
7 in some cases anyhow.

8 DR. BONACA: I'm saying there are some issues that
9 were important at that time that turned out to be no issues.
10 Some other issues that were not viewed as important turned
11 out to be big issues and I think there is some lessons
12 learned there that one might -- and I just was wondering if
13 you were looking for those and if they would help you in any
14 way.

15 That's all I was suggesting.

16 MR. WILSON: We haven't gone back and done that.

17 DR. KRESS: One of the items I'm particularly
18 interested in, one of the issue items, is the use of the
19 codes, the NOTRA and the other codes that they use in the
20 deterministic analysis.

21 The thing I would be interested in is clearly this
22 kind of power up-rate of this magnitude with the changes
23 that are being made in the design of the core and the
24 systems is going to result in decreasing the margins, these
25 Chapter 15 type margins.

1 The question I would have is you've got these
2 codes that are usually based on Appendix K like analysis,
3 that have built-in conservatisms and built-in biases, but
4 how will you know, using those, when you've eaten up too
5 much of your margin with respect to the figures of merit?

6 How will you make that determination in a review?
7 This is not a question of whether the codes are applicable
8 or not, but how would you make a determination that those
9 codes, using those codes, you still haven't eroded your
10 margins too far?

11 MR. WILSON: It's a judgment issue and I'm sure
12 that the staff is going to have to consider that and be
13 ready to discuss it with the committee when we come back
14 with our conclusions.

15 I know, in skimming Westinghouse's letter on phase
16 two, that they plan to address both the adequacy of using
17 the code and margins discussion.

18 DR. KRESS: Are there any other questions that
19 members have?

20 DR. POWERS: On this area of codes, I've known a
21 couple of code builders in my lifetime.

22 DR. KRESS: You certainly have.

23 DR. POWERS: And codes are never static. So when
24 they say we're going to use the same codes, with limited
25 modifications, do we know what that means? Typically, these

1 codes are always -- I mean, they've gone to modifications
2 now in the two and three decimal point range.

3 Would they really be using exactly the same code
4 that they used for AP600?

5 MR. WILSON: I understand the question you're
6 asking, and we don't know that yet. I think until they make
7 their submittals, we'll know that level of detail.

8 What Westinghouse is proposing is that the
9 information they feel is sufficient for us to make that
10 evaluation, they will have that available by the first of
11 November.

12 DR. POWERS: The other question that comes up is
13 that the NRC itself did some experimental work in connection
14 with its review of the AP600, notably some work done at the
15 ROSA facility.

16 I was in a briefing on the status of the research
17 program a couple of weeks ago and the speaker from RES stood
18 up and listed down all of the experimental facilities that
19 they no longer had access to now and the ones that he
20 anticipated they would not have access to in the near
21 future.

22 One of those was the ROSA facility. But are we
23 confident that as part of this phase two process, do you
24 interact with the RES people to see if they feel like they
25 could use whatever data they got from the ROSA facility for

1 evaluating a 1000 or do they feel they would have to do
2 additional experiments?

3 MR. WILSON: I don't think we'll be ready to
4 determine that until we see Westinghouse's proposal.

5 DR. KRESS: We think that will involve some sort
6 of new scaling analysis, at least a scaling to the 1000.

7 MR. GRIMES: If I could offer this. I would
8 expect that we would want to fully engage the research staff
9 in phase two in assisting us in determining what the needs
10 are going to be based on their advice.

11 So I would expect that they would be involved to
12 the extent that they give us feedback that suggests that
13 there may be a need for additional -- in their view,
14 additional testing, then we need to have a dialogue with
15 Westinghouse to find out whether they agree or disagree and
16 if so, who is going to do it and those sorts of things.

17 DR. POWERS: But it will happen.

18 MR. GRIMES: Yes.

19 DR. POWERS: And it's something not to put off,
20 because I think decisions are being made on the retirement
21 of facilities left and right, right now. And NRC no longer
22 makes -- NRC itself doesn't make the decision anymore. It's
23 in the hands of other people.

24 DR. KRESS: The codes we're talking about, NOTRA,
25 COBRA TRAC, LOFTRAN and WGOTHIC, I think, as best I

1 remember.

2 The LOFTRAN is a neutronics code and I don't see
3 how they can get this power upgrade without increasing the
4 enrichment. Has that been thought about yet? I haven't
5 seen what their full proposal is to get their power up-rate,
6 but I can't see how they can do it without enriching --
7 increasing their enrichment, and I worry a little bit about
8 --

9 MR. WILSON: Staff doesn't have that level of
10 information yet.

11 DR. KRESS: You don't have that detail either yet.
12 That's something for later, I guess.

13 MR. WILSON: Yes.

14 DR. POWERS: It seems to me, enrichment, I think,
15 bothers me less than the issues of going to higher burn-up,
16 which I don't think we recognized so fully when we did 600.

17 Now we understand that not only enrichments of 62
18 gigawatt days -- I mean, burn-ups of 62 gigawatt days per
19 ton are possible, but we have to think in terms of 75 as a
20 possibility on that, and those things -- that seems like a
21 bigger stretch for existing codes than just the enrichment
22 issues, as long as you stay below five percent.

23 DR. KRESS: I'm not even sure they could stay
24 below five percent and get the up-rate. That's why it was
25 bothering me, because our database is five percent.

1 DR. SEALE: But the linear heat rating is no
2 higher than it is in some of the forced convection PWRs.
3 And so the product of enrichment times flux is comparable.
4 That's what the linear heat rating is.

5 DR. KRESS: Of course.

6 DR. SEALE: So that's not the problem. The
7 problem, it strikes me anyway, is whether you can get 20
8 percent more heat out of those fuel bundles with a natural
9 circulation --

10 DR. POWERS: Bigger driving force, Bob.

11 DR. KRESS: That will be one of the issues, of
12 course.

13 MR. GRIMES: I would like to point out the nature
14 of your dialogue illustrates the extent to which the staff
15 is put into a position of trying to make an assessment about
16 whether or not we have a good enough idea about what's going
17 to be involved in the review to start it with a reasonable
18 expectation of the projected level of effort and impact on
19 resources, but not get into so much detail that we actually
20 perform the review itself.

21 Obviously, Westinghouse has come to a conclusion
22 that they can squeeze enough heat out of a core that's two
23 feet longer and still maintain some semblance of the design
24 advantages of the AP600, that they've got a marketing
25 strategy that says they should get a return on that

1 investment.

2 So we will be very interested to explore some of
3 these details, but we're going to have to leave some of that
4 to phase three. Otherwise, we won't have anything left to
5 charge them for.

6 DR. POWERS: So you have your own marketing
7 strategy here.

8 DR. SEALE: The thing that bothers me is that I --
9 and you've made it clear, that any promises are conditional
10 in the sense that if it's necessary to do some testing,
11 presumably that can be -- I mean, they can make the decision
12 at that time.

13 But it's hard when -- if they get into this thing
14 on the basis of one assumption and then partway down the
15 road, after you've done some of these analyses, you suddenly
16 decide they do need something else.

17 DR. KRESS: I think that's a chance they take.

18 DR. SEALE: And I guess, you know, they're big
19 boys and -- but on the other hand, I hope they're not
20 unrealistic.

21 DR. UHRIG: I was just going to comment that I
22 thought the testing was paid for by NRC, the ROSA facility.
23 Am I correct on that?

24 DR. KRESS: The ROSA was, but it's not likely that
25 will be redone.

1 DR. POWERS: I mean testing paid for by the NRC
2 has a strange --

3 DR. UHRIG: Well, it came out of the research
4 budget, I should say.

5 DR. POWERS: But in the end, that comes out of --

6 DR. KRESS: It comes out of the industry.

7 DR. POWERS: -- Westinghouse's hide here
8 someplace.

9 DR. KRESS: Somehow or other, yes.

10 DR. UHRIG: Well, it came out of the industry
11 side.

12 DR. BONACA: I just have a question. I have not
13 been part of the certification of AP600, so I confess
14 ignorance about the specifics of that. Testing for AP600,
15 what specific portion was it? Was it containment and the
16 passive systems?

17 DR. KRESS: They had a combination of all those,
18 passive systems, containment, the primary system and two
19 different facilities and the NRC had one and the other one.
20 It's a complicated -- it's a pretty extensive test
21 program.

22 DR. UHRIG: They also tested the ECCS system, the
23 passive system.

24 DR. BONACA: So the core design was a pretty
25 radical departure from the one we know for --

1 DR. KRESS: It wasn't a real radical departure
2 from a normal core.

3 DR. BONACA: Going back, I wonder how much of this
4 core that is 14 feet high, as the Texas Project, is
5 different from that project, I really wonder.

6 DR. SEALE: We don't know yet.

7 DR. BONACA: So how much of that they will rely
8 on, whether they will call it proven.

9 DR. KRESS: I guess that remains to be seen.

10 DR. POWERS: What you, I think, safely predict is
11 that it's not going to be something radical. I mean, I
12 don't think we're talking about fluted rods here and things
13 like that.

14 DR. KRESS: No, no, no. It will be the same.

15 DR. BONACA: I would say that, for example, 615
16 degrees seems high and I wouldn't expect that temperature at
17 the Texas Project.

18 So what other features may be -- all the fuel, for
19 example, they were able to pull out a lot of power from
20 pretty aggressive designs for core implants by having the
21 integral mixers and getting a lot of D&B margin on those and
22 I wonder how much of that they'll rely on for this. It will
23 be interesting to know --

24 DR. KRESS: That would be interesting.

25 DR. BONACA: -- if that would facilitate the

1 review.

2 DR. KRESS: We will be interested in continuing
3 this interaction and dialogue on this. Are you looking for
4 a letter form us on this phase one part?

5 MR. WILSON: I believe that we have, in effect,
6 received the committee's views on phase one, from the NRC
7 staff's perspective, that was sufficient. So it's up to you
8 whether you want to write another letter or not, but we
9 don't need one.

10 DR. KRESS: We are generally reluctant to comment on things
11 like schedules and scope and dollars, but if we have
12 comments about or feelings about the five assumptions, would
13 that be of use to you if we commented on those?

14 MR. WILSON: Yes.

15 MR. GRIMES: I would like to specifically ask that
16 -- understand that we are interested in what particular
17 technical issues you feel might be troublesome during the
18 phase three review and your challenges, to see whether or
19 not you can characterize the nature of the issues and how
20 they need to be addressed in such a way as to not intimidate
21 Westinghouse from wanting to pursue phase three.

22 DR. KRESS: Don't want to discourage them.

23 DR. WALLIS: Can I ask about the codes? We had
24 some problems with code documentation in AP600. And even if
25 the results are believable when you look at the experiments,

1 there is a credibility issue when the code documentation is
2 not impressive, let's say.

3 I just don't know how much we're going to go into
4 that issue with AP1000.

5 MR. WILSON: At the phase two review, determining
6 whether or not those codes are acceptable for use in doing
7 the actual analyses, I suspect we won't get into
8 documentation very much. But if we proceeded to design
9 certification, I would assume we would get into that issue.

10 DR. WALLIS: That's what bothered me with AP600,
11 is we went through all these phases and at the very end of
12 the process, decided to look into the details of the
13 documentation and this gave some of us some qualms.

14 That shouldn't wait till the end.

15 DR. POWERS: I think Graham has hit upon one thing
16 that you do want to bear in mind, maybe attach it as a
17 codicil under estimates that you're giving Westinghouse, is
18 it really does hinge on having a good quality application
19 and that's the documentation in the application. And
20 certainly I think this committee spent a lot of time, a lot
21 of its time with -- was delayed in the last one because of
22 documentation issues.

23 To the extent that they can --

24 MR. WILSON: From the staff's perspective, quality
25 documentation effects the length and cost of our review.

1 DR. POWERS: That's right.

2 DR. SEALE: From the point of view of -- the one
3 thing that could help the most that's pure paper product and
4 hence probably the easiest thing to get at this stage, if
5 you guys -- if they could really nail it on the scaling
6 analysis, so we don't go through this agony we went through
7 on the AP600, but really tie it down, it strikes me that
8 would probably be the most constructive thing you could do
9 early on to resolve all of these questions about the codes,
10 utility of tests and everything else.

11 MR. WILSON: Well, they're going to have to, in
12 your words, really nail it in order to persuade the staff
13 that no further testing is necessary.

14 DR. KRESS: I guess we'll turn it back to you, Mr.
15 Chairman.

16 DR. POWERS: Thank you. It's always exciting to
17 see new plants coming out. I was excited about that.

18 At this point, I think we can dispense with the
19 transcription.

20 [Whereupon, at 2:40 p.m., the recorded portion of
21 the meeting was concluded.]

22
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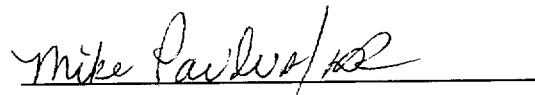
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This is to certify that the attached proceedings
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NAME OF PROCEEDING: 475TH ADVISORY COMMITTEE
ON REACTOR SAFEGUARDS

PLACE OF PROCEEDING: ROCKVILLE, MD

were held as herein appears, and that this is the original
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A handwritten signature in cursive script, reading "Mike Paulus", followed by a horizontal line.

Mike Paulus

Official Reporter

Ann Riley & Associates, Ltd.



**ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
AUGUST 29, 2000**

**BRIEFING ON AP1000 STANDARD PLANT DESIGN
by
Jerry N. Wilson - Senior Policy Analyst /RLSB/NRR**

Background

- NRC certified the AP600 design on January 24, 2000
- Westinghouse
 - ▶ Designing a 1000 Mwe version of the AP600
 - ▶ Considering applying for design certification
 - ▶ Requested a pre-application review to determine the scope & cost of a design certification review for the AP1000 standard plant design

AP1000 Design

- Increase power to reduce cost/KW
- Minimize changes to AP600 design
- Increase number & length of fuel assemblies
- Increase height of reactor vessel
- Increase capacity of reactor coolant pumps
- Increase pressurizer volume
- Increase size of Steam Generators
- Increase containment volume & design pressure
- Increase capacity of ADS

AP1000 Application

- Retain ~ 80% AP600 design control document
- Rely on the AP600 test program for AP1000
- Use AP600 analysis codes with minor modifications
- Use portion of the AP600 PRA, Level 1
- Defer selected design activities to combined license
- Use the same (AP600) industry codes & standards

AP1000 Pre-application Review

- Phase one - complete
 - ▶ NRC met with Westinghouse on April 27, 2000
 - ▶ Westinghouse requested start with May 4th letter
 - ▶ Westinghouse identified issues with May 31st letter
 - ▶ ACRS identified issues with June 21st letter
 - ▶ NRC - issues, information & estimates - July 27th

- Phase two - requested
 - ▶ Westinghouse requested start in their August 28th letter and identified deliverables and schedule
 - ▶ NRR will use PBPM process to determine workload priority

- Phase three - Design Certification Review?

Risk-Informed Part 50 Option 2

Overview of SECY-00-xxx "Risk-Informing Special
Treatment Requirements"

475th ACRS Meeting
August 29, 2000

*Timothy A Reed
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation*

Objective of Option 2 SECY

- Provides preliminary views of ANPR comments
- Discusses conceptual approach to implementing Option 2 rulemaking plan
- Supports September 29, 2000 Commission brief

ANPR Comments

- Generally supportive of rulemaking
- Preliminary views on eight topics presented in SECY
- SECY attachment groups all ANPR comments into eight tables w/preliminary responses
- Final ANPR comment response -- proposed rule

ANPR Preliminary Views

Highlights of Significant Comments

- Selective Implementation -- identify all RISC-1 and 2 SSCs
- Impact on Other Regulations -- believe Part 54 should be risk-informed
- Need for Prior NRC Review -- objective continues to be little or no prior review
- PRA Quality -- Will consider other methods than consensus standards (NEI PRA certification)

ANPR Preliminary Views Cont'

Highlights of Significant Comments

- Approach -- believe can do all Option 2 rules in a single rulemaking (except §50.36)
- Part 21 -- may be necessary to modify Part 21 to remove RISC-3 SSCs from scope
- Part 21 should not apply to RISC-2 -- may be reporting but would be in §50.69

Option 2 Rulemaking Approach

- Consistent with SECY-99-256
- Robust categorization
- Licensees maintain functional capability of SSCs using existing or new programs
- RISC-2 SSCs -- control reliability, availability, capability per categorization process
- RISC-3 SSCs -- maintain design functions as described in UFSAR
- Describe in UFSAR how meet requirements

Ongoing Tasks

- Review of NEI implementing guidance
 - Treatment and categorization guideline
 - PRA peer certification guideline
 - Industry pilot effort
- STP exemption review
- Contractor work -- commercial processes
- Continued interactions with stakeholders
 - Meeting with NEI in mid-September
 - Commission brief --September 29

Summary Of SECY

- ANPR comments generally supportive of effort to risk-inform special treatment requirements
- Rulemaking approach is consistent with SECY-99-256
- Review of STP exemption request continues
- Will continue interaction with stakeholders during development of new rule

Risk-Informed 10 CFR 50.44 "Standard for Combustible Gas Control System in Light-Water- Cooled Power Reactors"

**Presented to
Advisory Committee on Reactor Safeguards**

Presented by
Tom King, Mark Cunningham, Mary Drouin
Office of Nuclear Regulatory Research

August 29, 2000

U.S. Nuclear Regulatory Commission



OBJECTIVE

Risk-Informed Revisions to 10 CFR Part 50

- Enhance safety by focusing NRC and licensee resources in areas commensurate with their importance to health and safety
- Provide NRC with a framework to use risk information to take action in reactor regulatory matters
- Allow use of risk information to provide flexibility in plant operation and design, which can result in burden reduction without compromising safety

Page 2 of 17

RISK-INFORMED 10 CFR 50.44

"Standard for Combustible Gas Control System in Light-Water-Cooled Power Reactors"

- **Objective:** control combustible gases (as a result of the design basis accident) that could challenge containment integrity, thereby, potential radionuclide release
- Rule specifies analytical requirements (e.g., accidents of concern, sources and amounts of combustible gases) and physical requirements to demonstrate analytical requirements are no challenge
- Work performed indicate no safety benefit or risk significance associated with parts of the regulation and some risk issues not addressed by regulation

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50.44 TECHNICAL REQUIREMENTS

Analytical Requirements Imposed by the Rule

- The type of accident to be considered
 - Loss of coolant accident
 - Degraded core
- Type of combustible gas
 - Hydrogen
- Source of hydrogen
 - Fuel-cladding oxidation
 - Radiolytic decomposition of coolant
 - Corrosion of metal
- Hydrogen source term
 - 5% oxidation reaction over 2 minute period
 - 75% metal-water oxidation reaction for Mark III and ice condenser containments

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50.44 TECHNICAL REQUIREMENTS

Physical Requirements Imposed by the Rule

- Measure the hydrogen concentration in containment
- Insure a mixed containment atmosphere
- Control combustible gas concentration in containment following a LOCA (recombiners)
- Install high point vents on all reactors
- Inert atmosphere in Mark I and II containments
- Provide hydrogen control system (igniters) in Mark III and Ice Condenser containments

Page 5 of 17

RISK SIGNIFICANCE OF COMBUSTIBLE GASES

- Core damage/melt accident can potentially produce combustible gases (both hydrogen and carbon monoxide) from both fuel cladding oxidation and core-concrete interaction
- Control of post-LOCA hydrogen via a vent-purge methods can unnecessarily lead to radionuclide release to the atmosphere
- Depending on containment type and accident type, conditional large early release probability range from 0.1 to 1.0
- Hydrogen combustion not a significant challenge to containment integrity in the short term (~24 hours)
 - Large dry and subatmosphere due to large volume
 - Mark I and II due to inert atmosphere
 - Mark III and Ice Condenser due to igniters (except for station blackout)
- Combustible gas concentration may be sufficient to challenge containment integrity in long term
 - From core-concrete interaction for large dry, subatmosphere, ice condenser and Mark III
 - Oxygen generation from radiolysis can lead to de-inerted atmosphere in Mark I and II

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50.44 RISK-INFORMED ALTERNATIVE

- | | |
|---------------|---|
| 1. Concern | Combustion of gases poses challenge to containment integrity |
| 2. Strategy | Relates to mitigative strategy of limiting radionuclide releases |
| 3. Importance | Risk studies indicate conditional large early release probability for certain containment and accidents >0.1. |

⇒ *not a candidate rule for elimination*

Page 7 of 17

50.44 RISK-INFORMED ALTERNATIVE (continued)

Analytical Requirements ⇒ *Enhance*

- Specify hydrogen source term based on realistic calculations
- Source term based on more likely severe accidents including both in-vessel and ex-vessel combustible gas generation
- Combustible gases include hydrogen and carbon monoxide
- Combustible gas control after 24 hours after onset of core damage be covered by Severe Accident Management Guidelines
- Similar to Mr. Christie's petition except that he requests a source term based on realistic calculations for accident with a high probability of causing severe reactor core damage

Page 8 of 17

50.44 RISK-INFORMED ALTERNATIVE (continued)

Measure hydrogen concentration ⇒ *Eliminate requirement*

- Hydrogen monitoring not needed to initiate or activate the hydrogen control systems for each of the containment types
- Hydrogen monitors have limited significance in mitigating threat to containment in early stages of a core melt accident
- Mr. Christie's petition also request elimination of this requirement

Page 9 of 17

50.44 RISK-INFORMED ALTERNATIVE (continued)

Insure mixed atmosphere ⇒ ***Retain requirement***

- Needed to maintain defense-in-depth
- Needed to meet intent of GDC 50
- GDC 50 -- the containment and its compartments shall accommodate, with sufficient margin, the effects of potential energy sources including those from metal-water and other chemical reactions
- Current features that promote atmospheric mixing will not be degraded by any future plant modifications
- Mr. Christie's petition did not address this requirement

Page 10 of 17

50.44 RISK-INFORMED ALTERNATIVE (continued)

Control H2 for postulated LOCA ⇒ ***Eliminate requirement***

- Type of accident not risk significant
- Means to control concentration (e.g., recombiners) do not provide any benefit
- Vent-purge method can result in unnecessary radionuclide releases to atmosphere
- Mr. Christie's petition included eliminating this requirement

Page 11 of 17

50.44 RISK-INFORMED ALTERNATIVE (continued)

Inert Mark I/II containments ⇒ ***Retain requirement***

- Removal would result in integrity of Mark I and II containment being highly vulnerable to hydrogen combustion
- Mr. Christie's petition included retaining this requirement

Page 12 of 17

50.44 RISK-INFORMED ALTERNATIVE (continued)

Install high point vents ⇒ *Retain requirement*

- Combustible gases in RCS can inhibit flow of coolant to the core
- Capability to vent the RCS provides a safety benefit
- Mr. Christie's petition included retaining this requirement

Page 13 of 17

50.44 RISK-INFORMED ALTERNATIVE (continued)

H2 control system (igniters) for Mark III and Ice Condensers
⇒ *Enhance requirement*

- Modify to control hydrogen during risk significant core melt accidents
- Control system uses igniters which are AC dependent
- Under SBO conditions, igniters not available and containment vulnerable to hydrogen combustion
- SBO shown to be large contributor for some plants
- Mr. Christie's petition only proposes that the hydrogen control system be capable of meeting a specified performance level. Vulnerability under SBO conditions would still exist.

Page 14 of 17

50.44 RISK-INFORMED ALTERNATIVE (continued)

⇒ *Alternative (performance-based) requirement*

- Alternative that would allow licensee to use risk information
- Demonstrate plant meets specified performance criteria
 - e.g., maintain containment integrity for at least 24 hours for all risk-significant events
- Attractive for future plants
- Mr. Christie's petition included a requirement that for facilities with other types of containments "*must demonstrate that the reactor containment can withstand, without any hydrogen control system, a hydrogen burn for accidents with a high probability of causing severe core damage.*" Believe staff recommendation is equivalent.

Page 15 of 17

50.44 RISK-INFORMED ALTERNATIVE (continued)

Alternative ⇒ *"Long-term" recommendation*

- Long term control (greater than 24 hours after onset of core damage) be included as part of licensee's Severe Accident Management Guidelines
- Combustible gases still pose challenge to containment integrity in the long term with the possibility of a large late radionuclide release
- Mr.Christie's petition did not address the concern of long-term combustible gas control

Page 16 of 17

PHASE II

Upon Commission Approval

- Proceed with rulemaking

Page 17 of 17



Risk-Informing NRC Regulations

August 29, 2000 ACRS Meeting

Adrian Heymer, NEI



Option 2

■ Risk-informed regulatory regime

- Focus on SSCs and activities that are safety-significant
- Significant interaction and requirements being imposed on RISC-3 SSCs

■ ASME Standard & PRA certification

- Peer review -- an acceptable methodology to assess PRA suitability for Option 2
- Further interactions to resolve NRC comments

Option 3 -- Implementation

- **Regulations (mandatory or optional) should not place unnecessary resource burden on licensees or NRC staff**
- **NRC decision on including new regulatory elements should be based on:**
 - Up-to-date technical analyses and information
 - Estimates of licensee/NRC benefits & burden

Option 3 -- Implementation

- **NRC Framework -- document being revised**
- **§50.44 -- Must be sound technical basis for including or excluding optional requirements**
- **Estimate of additional burden?**
- **§50.46 -- Redefinition of Large-Break LOCA**
 - NEI interacting with NSSS Owners' Groups to develop a common approach
 - Follow-on activities



CLARIFYING THE DEFINITION OF DESIGN BASES

Presentation to the Advisory Committee on Reactor Safeguards

August 29, 2000

Stewart Magruder

Office of Nuclear Reactor Regulation

(301) 415-3139

OBJECTIVE

- Develop guidance that provides a clearer understanding of what constitutes design bases information as defined in 10 CFR 50.2

10 CFR 50.2 DEFINITION

Design Bases means that information which identifies the specific functions to be performed by a structure, system, or component of a facility, and the specific values or ranges of values chosen for controlling parameters as reference bounds for design. These values may be (1) restraints derived from generally accepted “state of the art” practices for achieving functional goals, or (2) requirements derived from analysis (based on calculation and/or experiments) of the effects of a postulated accident for which a structure, system, or component must meet its functional goals.

RELEVANCE OF DESIGN BASES

- “Design Bases” used in following regulations:
 - 50.34 (FSAR content)
 - 50.59 (Changes - Effective early 2001)
 - 50.72, 50.73 (Reporting - Until early 2001)
 - Appendix A to Part 50 (GDC)
 - Appendix B to Part 50 (QA)
- Useful for evaluating degraded and nonconforming conditions

BACKGROUND

- Engineering team inspections (Late 1980s)
- Industry guidance (NUMARC 90-12)
- NUREG-1397 (February 1991)
- Commission Policy Statement (August 1992)
- Millstone/Maine Yankee (1996)
- Nine Mile Point - reporting issue (1997)
- Revised industry guidance (NEI 97-04)
- Staff committed to develop regulatory guidance

Draft Guidance (DG-1093)

- Endorsed Appendix B of NEI 97-04 with two exceptions
- Briefed ACRS on 10/1/99 and 11/5/99
- Published for comment 4/12/00
- 11 comment letters - supportive of effort
 - ▶ NEI
 - ▶ Utilities (9)
 - ▶ NRC Region III

DG-1093 EXCEPTIONS

- Defense-in-Depth
 - ▶ Important aspect of principal design criteria
 - ▶ Provides standard for judging design bases

- Relationship to UFSAR
 - ▶ Design bases may change as a result of plant modifications to ensure compliance with current requirements
 - ▶ Supporting design information is required to be included in UFSAR

PROPOSED FINAL REGULATORY GUIDE

- Endorses Appendix B of NEI 97-04 with no exceptions
- NEI modifications addressed staff concerns

GENERAL GUIDANCE

- *Design bases functions:* Functions performed by systems, structures and components that are (1) required, or otherwise necessary to comply with, regulations, license conditions, orders or technical specifications, or (2) credited in licensee safety analyses to meet NRC requirements.
- *Design bases values:* Values or ranges of values of controlling parameters established as reference bounds for design to meet design bases functional requirements. These values may be (1) established by NRC requirement, (2) derived from or confirmed by safety analyses, or (3) chosen by the licensee from an applicable code, standard or guidance document.

SUMMARY

- Staff and industry have reached a common understanding of the term
- Public comments support guidance document
- Request ACRS letter approving publication of final Regulatory Guide endorsing industry guidance

**ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
475th MEETING**

**DRAFT REPORT:
“CAUSES AND SIGNIFICANCE OF DESIGN-BASIS ISSUES
AT U.S. NUCLEAR POWER PLANTS”**

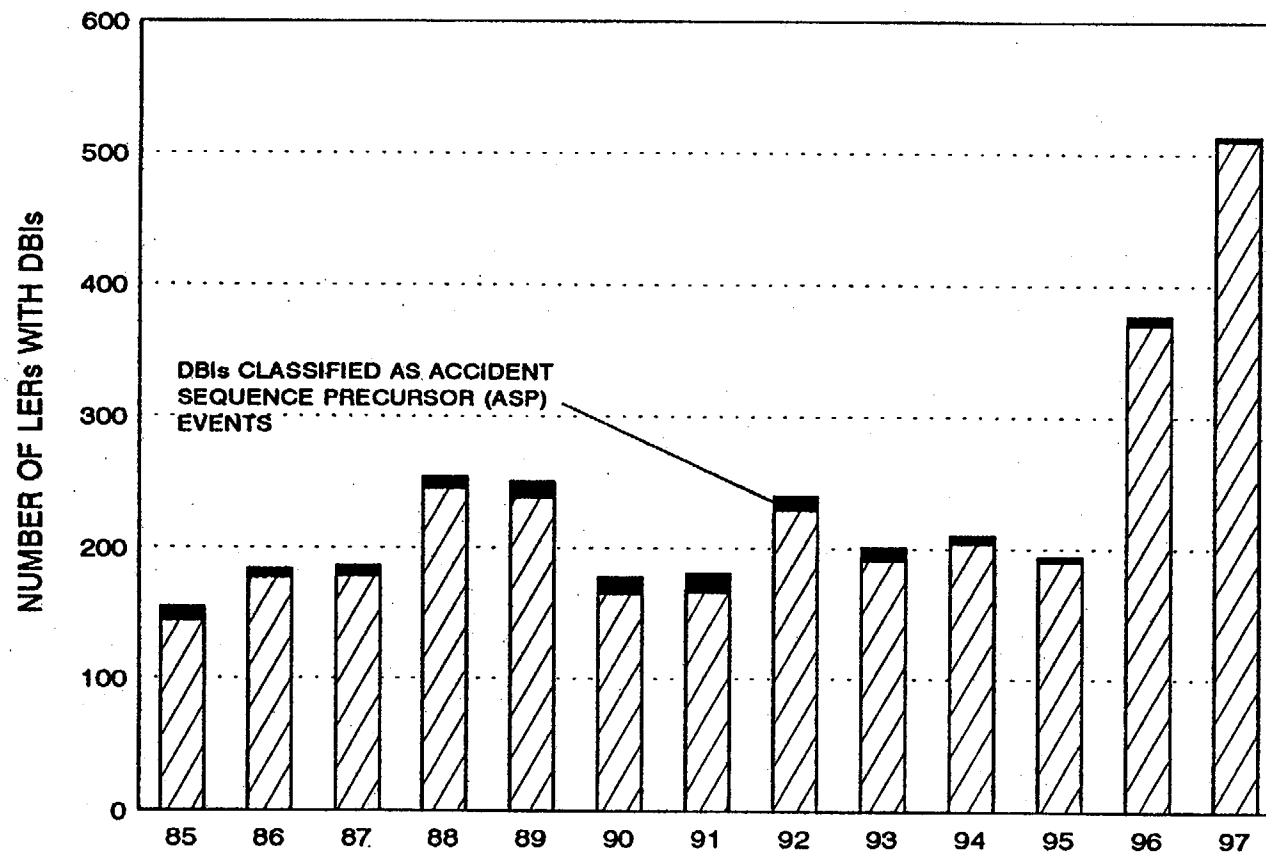
RONALD LLOYD

OFFICE OF NUCLEAR REGULATORY RESEARCH

**AUGUST 29, 2000
ROCKVILLE, MARYLAND**

Reporting Trends for DBIs from 1985 Through 1997

- 1. Over 3100 Total LERs with DBIs**
- 2. Increases in the Number of Reported DBIs Coincided with NRC Initiatives**
- 3. Over 500 LERs with DBIs in 1997 (Focus Area)**
- 4. Small Percentage of DBIs Classified as Accident Sequence Precursor (ASP) Events**
- 5. Over 80 Percent of DBIs Reported as “Unanalyzed Conditions”**



DBI Risk-Informed, Deterministic Significance Framework

LERs Were Assessed in Four Different Areas

- 1. DBI Risk Category**
 - Potential**
 - Minimal**
 - None**
- 2. Safety Demand Present**
 - Yes**
 - No**
- 3. Effect Type**
 - Actual Event**
 - Potential Event**
- 4. Effect Extent**
 - Failed System**
 - Degraded System**
 - Degraded or Failed Train**

DBI Risk-informed, Deterministic Significance Framework

GROUP	DBI SAFETY SIGNIFICANCE CATEGORY		DBI RISK CATEGORY			DBI DETERMINISTIC SIGNIFICANCE CLASSIFICATION						
						Safety Demand		Effect Type		Effect Extent		
			Potential	Minimal	None	Yes	No	Actual	Potential	Failed System	Degraded System	Degraded or Failed Train
I	1	a	x			x		x		x		
		b	x			x		x			x	
		c	x			x		x				x
	2	a	x				x	x		x		
		b	x				x	x			x	
		c	x				x	x				x
	3	a	x				x			x		
		b	x				x				x	
		c	x				x					x
II	4	a		x		x		x		x		
		b		x		x		x			x	
		c		x		x		x				x
	5	a		x			x	x		x		
		b		x			x	x			x	
		c		x			x	x				x
	6	a		x			x			x		
		b		x			x				x	
		c		x			x					x
	7	-			x							

OBSERVATIONS

The Most Common Causes¹ of DBIs Were:

- **Original Design Error 72 %**
- **Procedure Deficiency 28 %**
- **Human Error 22 %**

¹More than one cause was generally listed for each DBI

**There Was a Significant Variation Among Plants
in the Number of Reported DBIs**

1997 Data

	<u>Range</u>
• DBIs Reported	0 - 37
• Engineering Inspection Hours	90 - 3700
• Engineering Inspection Hours per DBI	15 - 630

A Few Safety-related Systems Accounted for about Half of the DBIs

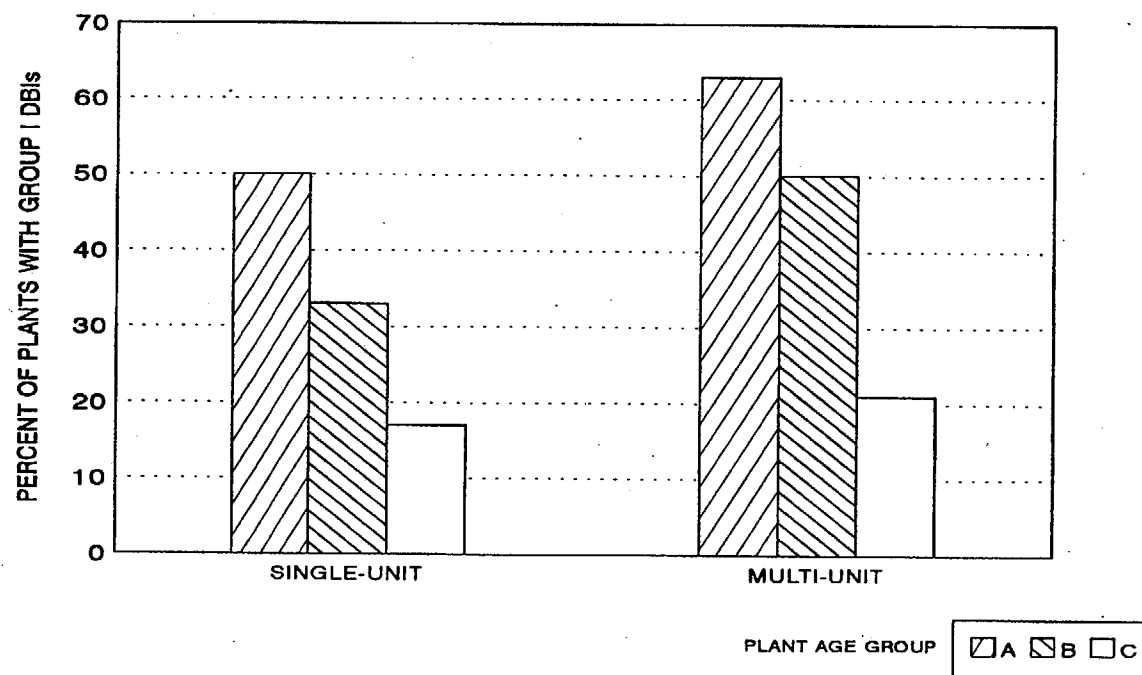
System	Group 1 and Group 2 DBIs	Group 1 DBIs Only
Emergency Core Cooling	13%	34%
Emergency ac/dc Power	11%	18%
Containment and Containment Isolation	7%	12%
Primary Reactor	7%	2%
Auxiliary/Emergency Feedwater	6%	3%
Emergency Service Water	6%	4%

- **Group 1: Potentially Risk Significant (19%)**
- **Group 2: Minimal or no Risk Significance (81%)**

Older Plants Generally Reported More DBIs Than Newer Plants

- **Group A: Licensed Between 1964 and 1974 (44 Units) 5.6 DBIs/Unit**
- **Group B: Licensed Between 1975 and 1984 (35 Units) 4.7 DBIs/Unit**
- **Group C: Licensed Between 1985 and 1997 (31 Units) 3.1 DBIs/Unit**

Group I DBIs Were More Likely at Multi-Unit Sites than Single-Unit Sites



The Percent of LERs with DBIs That Were ASP Events Steadily Decreased, While the Number of DBIs Increased

During 1990–1997:

- **The Percent of DBIs Classified as ASP Events Decreased From Approximately 8% to less than 1%**
- **The Total Number of ASP-DBI Events Decreased from 13 to 3**
- **The Total Number of ASP Events from All Causes Decreased From 28 to 5**

Important accident sequence precursor events (1992-1997)

Plant	Event Date	Description	Involved DBI	BWR/ PWR	CCDP
Ft. Calhoun	07/03/92	Reactor Trip Due to Invertor Malfunction and Subsequent Pressurizer Safety Valve Leak	No	PWR	2.5×10^{-4}
Robinson 2	08/22/92	Unusual Event Due to Loss of Off-Site Power and Reactor Trip	No	PWR	2.1×10^{-4}
Turkey Pt. 3, 4	08/24/92	Loss of Offsite Power Due to Hurricane Andrew	No	PWR	1.6×10^{-4}
Oconee 2	10/19/92	Loss of Off-site Power and Unit Trip Due to Management Deficiencies, Less than Adequate Corrective Action Program	No	PWR	2.1×10^{-4}
Sequoyah 1, 2	12/31/92	Reactor Trip as a Result of a Switchyard Power Circuit Breaker Fault and a Unit 2 Entry Into Limiting Condition for Operation [LCO] 3.0.3 when Both Centrifugal Charging Pumps were Removed from Service	No	PWR	1.8×10^{-4}
Catawba 1, 2	02/25/93	Technical Specification 3.0.3 Entered Due to Inoperable Pump Discharge Valves	Yes	PWR	1.5×10^{-4}
Perry	04/19/93	Excessive Strainer Differential Pressure Across the residual heat removal (RHR) Suction Strainer Could Have Compromised Long Term Cooling During Post-LOCA Operation	No	BWR	1.2×10^{-4}
LaSalle 1	09/14/93	Unit 1 Scram and Loss of Off-Site Power Due to Bus Duct Water Intrusion	No	BWR	1.3×10^{-4}
Haddam Neck	02/16/94	Automatic 480 Volt Bus Transfer Failure Due to Circuit Breaker Malfunction	No	PWR	1.4×10^{-4}
Wolf Creek	09/17/94	Reactor Coolant System Blows Down to Refueling Water Storage Tank During Hot Shutdown	No	PWR	3.0×10^{-3}
St. Lucie 1	08/02/95	Failed PORVs, Reactor Coolant Pump, Seal Failure, Relief Valve and Subsequent Shutdown Cooling System Unavailability, Plus Other Problems	Yes	PWR	1.1×10^{-4}
Wolf Creek	01/30/96	Loss of Circulating Water Due to Icing on Traveling Screens Causes Reactor Trip	No	PWR	2.1×10^{-4}
Catawba 2	02/06/96	Loss of Off-Site Power Due to Electrical Component Failures	No	PWR	2.1×10^{-3}
Haddam Neck	08/01/96	Potential for Inadequate RHR Pump Net Positive Suction Head During Sump Recirculation	Yes	PWR	1.1×10^{-4}

Group I DBIs Varied by NRC Region

Percent of Plants with Group I DBIs

Region I	52%
Region II	36%
Region III	59%
Region IV	19%

**For 1995–1997,
DBIs Appeared to Correlate with NRC Engineering Inspection Effort**

- **An Increase in the Number of Inspection Hours Generally Resulted in an Increase in the Number of Reported DBIs**

Plants with the largest total number of DBIs (1990-1997)

Plant Name	Number of DBIs	Number of ASP-DBIs
Crystal River 3	93	0
Millstone 1	85	0
Indian Point 3	59	0
Millstone 3	55	0
Palisades	55	0
Fort Calhoun	45	2
Millstone 2	43	1
Maine Yankee	41	1
Dresden 2	41	0
Haddam Neck	36	3
Salem 1	36	1

**The Importance and Applicability of DBIs Discussed in NRC
Generic Communications Occasionally Takes Several Years
for Licensees to Recognize and Address**

Generic communications on pressurized-water reactor containment sump strainer and boiling-water reactor emergency core cooling system strainer clogging

Date Issued	Information Notice/ Bulletin Number	Title
05/88	IN 88-28	Potential for Loss of Post-LOCA Recirculation Capability Due to Insulation Debris Blockage
11/89	IN 89-77	Debris in Containment Emergency Sumps and Incorrect Screen Configurations
01/90	IN 90-07	New Information Regarding Insulation Materials Performance and Debris Blockage of PWR Containment Sumps
09/92	IN 92-71	Partial Plugging of Suppression Pool Strainers at a Foreign BWR
04/93	IN 93-34	Potential for Loss of Emergency Cooling Function Due to a Combination of Operational and Post-LOCA Debris in Containment
05/93	IEB 93-02	Debris Plugging of Emergency Core Cooling Suction Strainers
10/95	IEB 95-02	Unexpected Clogging of a RHR Pump Strainer While Operating in Suppression Pool Cooling Mode
10/95	IN 95-47	Unexpected Opening of a Safety/Relief Valve and Complications Involving Suppression Pool Cooling Strainer Blockage
05/96	IEB 96-03	Potential Plugging of Emergency Core Cooling Suction Strainers by Debris in Boiling-Water Reactors
10/96	IN 96-059	Potential Degradation of Post Loss-of-Coolant Recirculation Capability as a Result of Debris
05/97	IN 97-027	Effect of Incorrect Strainer Pressure Drop on Available Net Positive Suction Head

Advisory Committee on Reactor Safeguards
Full Committee

Combustible Gas Control

August 29, 2000
Two White Flint, Rockville, MD

Bob Christie

Performance Technology Technology
P. O. Box 51663
Knoxville, TN 37950-1663
(865) 588-1444
FAX (865) 584-3043
performtech@compuserve.com

SUMMARY

Change Hydrogen Control Regulations as of 8/28/00

10CFR50.12 Exemption Requests	Petition for Rulemaking	SECY-98-300 Option 3 Framework	SECY-98-300 Option 3 10CFR50.44
Submitted:	Recent action:	Recent action:	Agreement:
San Onofre 2&3 - 9/10/98 Approved 9/3/99	ACRS 6/29/00	ACRS 6/29/00	Delete post LOCA hydrogen requirements
Oconee - 7/26/00	Letter - Christie to Mike Snodderly (NRC), 7/3/00	ACRS 7/11/00	Containment air mixing unchanged
	ACRS 7/12/00	Letter - Christie to Ashok Thadani (NRC), 7/19/00	Reactor Coolant System high point vents unchanged
	Letter - Christie to Sam Collins (NRC), 7/14/00	Letter - Christie to Ashok Thadani (NRC), 8/24/00	Mark I's and Mark II's inerted unchanged
	Letter - Christie to Cynthia Carpenter (NRC), 7/20/00		Disagreement:
			NRC staff wants to add long term requirements for hydrogen monitors
			NRC wants igniters operable during Station Blackout for Mark IIIs and ice condensers
Future action:	Future action:	Future action:	Future action:
Other submittals in preparation	ACRS 8/29/00	ACRS 8/29/00	ACRS 8/29/00
	Recommendation by NRC staff to NRC Commissioners at end of August 2000		Recommendation by NRC staff to NRC Commissioners at end of August 2000
	Mike Snodderly (NRC) working on open purge valve - severe accident		



W. R. McCollum, Jr.
Vice President

Duke Power
Oconee Nuclear Site
7800 Rochester Highway
Seneca, SC 29672
(864) 885-3107 OFFICE
(864) 885-3564 FAX

July 26, 2000

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555-0001

Subject: Duke Energy Corporation
Oconee Nuclear Station, Units 1, 2 and 3
Docket Numbers 50-269, 50-270 and 50-287
Request for Exemption to 10CFR50.44, 10CFR50, Appendix A, General
Design Criterion 41, and 10CFR50, Appendix E, Section VI.
Proposed Technical Specification Change Concerning
Hydrogen Control System (TSCR 2000-05)

Pursuant to the provisions of 10 CFR 50.12, "Specific exemptions," Duke Energy Corporation (Duke) is requesting an exemption to the requirements of 10 CFR 50.44, "Standards for combustible gas control system in light-water-cooled power reactors," 10 CFR 50, Appendix A, General Design Criterion 41, "Containment atmosphere cleanup," and 10 CFR 50, Appendix E, Section VI, "Emergency Response Data System." The purpose of this exemption request is to remove requirements for hydrogen control systems (i.e., containment post-accident hydrogen monitors and recombiners) from the Oconee, Units 1, 2, and 3 (ONS) design basis. With this change, the consideration of hydrogen generation would no longer be included in the design basis of ONS. Accordingly, the enclosed Technical Specification (TS) Change Request 2000-05 would remove the post-accident hydrogen control systems from the ONS TS and provide the basis for deletion of a Selected Licensee Commitment concerning hydrogen recombiners.

Enclosure 1 provides the documentation supporting the exemption request. Enclosure 2 is a license amendment request, which consists of five attachments. Attachments A and B provide mark-up and new pages of the Oconee TS, respectively. The Description of Proposed Changes and Technical Justification is provided in Attachment C. Attachments D and E provide the No Significant Hazards Consideration Evaluation and Environmental Impact Analysis, respectively.

As described in the enclosures, approval of the requested exemption would improve the safety focus at Oconee and represent a more effective and efficient method for maintaining adequate protection of public health and safety. The requested changes would permit simplification of Emergency and Emergency Response Plan Procedures thereby reducing operators' post-accident burden. Such simplification would enable operators to give priority to more important safety functions following postulated plant accidents.

1/2

It is Duke's intention that, upon NRC approval of this request, the description of the hydrogen control systems, its bases and other associated discussions would be removed from the UFSAR and from the Emergency and Emergency Response Plan Procedures.

A similar request for an exemption to the requirements of 10 CFR 50.44, and 10 CFR 50, Appendix A, General Design Criterion 41, 42 and 43 was approved by the NRC for San Onofre Nuclear Generation Station, Units 2 and 3, by letter dated September 3, 1999.

Implementation of this amendment to the Oconee Technical Specifications will impact the Oconee UFSAR. Necessary changes will be made in accordance with 10 CFR 50.71(e). Duke requests a 90-day grace period for implementation of this exemption request and the associated changes.

The Duke Nuclear Safety Review Board and the Oconee Plant Operations Review Committee have reviewed and approved this proposed Technical Specification amendment.

A copy of this application is being forwarded to the South Carolina Department of Health and Environmental Control for their review and, as appropriate, subsequent consultation with the staff.

Please contact Robert C. Douglas at 864-885-3073 with any questions regarding this submittal.

Very truly yours,



W. R. McCollum, Jr.
Site Vice President
Oconee Nuclear Station

Enclosures

2/2

Performance Technology

P.O. Box 51663, Knoxville, Tennessee 37950-1663 Phone: (423) 588-1444, Fax (423) 584-3043
performtech@compuserve.com 865

July 3, 2000

Mr. Mike Snodderly
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852-2738

Dear Mr. Snodderly:

Following our conversations last week, I spent some additional time over the weekend considering the approach you might want to use for the evaluation of the Emergency Operating Procedures at the nuclear units for hydrogen control during severe accidents. It is my belief that your time could be best spent in the following manner.

I recommend that if you want to perform any evaluations, you first evaluate those plants that have movable hydrogen thermal recombiners that must be physically installed after accidents to control hydrogen from design basis accidents. If the operators at these nuclear units contemplate the use of any system for hydrogen control during severe accidents, it will be the hydrogen purge system. Due to the large amounts of hydrogen which would be produced in a short time frame in severe accidents, the operators will recognize that the only hydrogen control system they have is the hydrogen purge system. Whether they would activate the hydrogen purge system in severe accidents is the question. I believe that the operators would not activate the hydrogen purge system in severe accidents but I have not evaluated the situation in detail. As you know, I have a concern about this situation because the activation of the hydrogen purge system during severe accidents would be very detrimental to public health risk.

After the evaluation of those nuclear units with movable hydrogen thermal recombiners, if you still believe you have to continue, I would continue with an evaluation of the nuclear units with permanent hydrogen thermal recombiners but that have a hydrogen purge system as backup. At these nuclear units, the hydrogen thermal recombiners will be the first system called upon for hydrogen control and the hydrogen purge system will be the backup. Neither system will be effective in severe accidents for controlling hydrogen, but I believe there is less likelihood of using the purge system in these nuclear units than in nuclear units with movable hydrogen thermal recombiners but this is only my opinion. The operators will still have to evaluate the use of the hydrogen purge system during severe accidents at these units.

1/2

RJC
7/3/00

During these evaluations, I am not sure that one could put much weight on 10CFR100 radiation dose accident calculations to determine whether an operator would or would not activate the hydrogen purge systems during severe accidents as you have suggested. As I stated in the ACRS Subcommittee on Probabilistic Risk Assessment meeting on June 29, 2000, I believe that 10CFR100 radiation dose accident calculations are not appropriate for severe accidents. There is also the matter of timing for 10CFR100 calculations. It is generally assumed that the 10CFR100 calculations for the activation of the hydrogen thermal recombiners for design basis events would take place days after the design basis accident. In severe accidents, large amounts of hydrogen can be produced in hours, not days and I doubt that anyone will have the time to perform 10CFR100 calculations. We should not be performing 10CFR100 dose calculations after severe accidents. RJC

As I have indicated to you in our previous conversations, your evaluation of the Emergency Operating Procedures is a matter of concern for the NRC in the immediate future. In my opinion, the best that we could hope for from your effort would be some "band aid" solutions to possible problems with the Emergency Operating Procedures. The permanent solution to the problem is to eliminate the requirements for the hydrogen thermal recombiners and the hydrogen purge systems following design basis events from the nuclear units. This permanent solution can be quickly achieved either by the approval of my petition for rulemaking or by the approval of 10CFR50.12 exemption requests. Personnel at the nuclear plants would like to solve the problem in a permanent fashion and I agree with them completely. In my opinion, the optimum solution would be to approve the petition for rulemaking in an expedited manner and allow the nuclear units to quickly eliminate the requirements for the hydrogen thermal recombiners and the hydrogen purge system from the Technical Specifications, Emergency Operating Procedures, Final Safety Analysis Reports, and any other place such requirements exist.

Please let me know of your progress on the evaluation of the Emergency Operating Procedures. Please contact me if you have any questions or desire further assistance.

Sincerely,


Bob Christie

cc: Cynthia A. Carpenter
Anthony W. Markley

2/2

Performance Technology

P.O. Box 51663, Knoxville, Tennessee 37950-1663 Phone: (423) 588-1444, Fax (423) 584-3043
performtech@compuserve.com 865

July 14, 2000

Mr. Sam Collins
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20872-2738

Dear Mr. Collins:

By my letter dated 10/7/99 to the NRC Commissioners, I raised safety issues regarding existing regulations for hydrogen control following postulated accidents. My letter to the Commissioners indicated that, based on the San Onofre Task Zero Safety Evaluation Report, strict compliance with existing regulations was detrimental to public health and safety. My letter was sent to you for action. Following discussions with your staff, I sent a letter to Mr. Frank Akstulewicz of your staff, dated 11/9/99, and agreed to treat part of my letter as a petition for rulemaking concerning 10CFR50.44 and 10CFR50, Appendix A, Criterion 41. Your letter to me dated 1/4/00, confirmed your staff was going to process my petition for rulemaking using the usual NRC practices.

As explained to me last year by your staff, I understand the usual NRC practices for rulemaking include consideration of "adequate protection" and consideration of 10CFR50.109, Backfitting. The usual practices also require that the petition for rulemaking be noticed for public comment, which occurred January 12, 2000. It was my understanding that my petition for rulemaking was to be considered on its own merits per these usual procedures. On June 29, 2000, your staff stated in an ACRS meeting that my petition was not being considered on its own merits but was being incorporated into "Option 3" of SECY-98-300. Later, your staff told me that my petition was not likely to be the recommended rulemaking from Option 3. This was the first time I heard of this decision by your staff.

In my 11/9/99 letter, I stated that it would be advantageous to make sure that Dr. Tom King and the people responsible for SECY-98-300, "Option 3" were aware of the actions of your staff in this matter. In your letter to me dated 1/4/99, you indicated that in addition to my petition for rulemaking being evaluated on its own merits, my letter had been sent to NRC Office of Research for consideration as part of NRC Research activities concerning "Option 3." I did not take this "addition" as meaning my petition would be evaluated by Option 3 standards and I do not believe in your letter that you meant that my petition be incorporated into the Option 3 evaluation.

My recommendation for changes to the regulations applies to all nuclear electric power units in the United States. I believe all the nuclear units are subject to the same

1/2

"When you measure performance realistically, it improves."

Rye
7/14/00

detrimental impact from the existing regulations. My petition for rulemaking is premised on the fact that existing hydrogen control regulations make all the nuclear units less safe than the units would be if the regulations were changed as I proposed. I believe the NRC staff Safety Evaluation Report for San Onofre is applicable to all the nuclear units. I believe that implementation of the proposed changes at all nuclear electric power units is necessary to improve safety. My petition for rulemaking should not be evaluated in Option 3 because my petition is not a "voluntary" effort applicable only to those nuclear units which "volunteer" for Option 3. The criteria used for evaluation in Option 3 go far beyond "adequate protection" and the backfit rule.

I have informed your staff that I do not believe my petition should be incorporated into Option 3 for evaluation and I have also informed the ACRS about this position in their meeting on July 12, 2000. There is no basis for treating my petition in a manner other than "standard practice." Approval of my petition for rulemaking will make the nuclear units "safer," therefore meeting the adequate protection criteria. My petition meets the requirements of 10CFR50.109, Backfitting. My petition has undergone the required period of public comment. My petition "risk-informs" the regulations and makes the regulations more effective and efficient. I believe it should be possible to make a decision on my petition on its own merits in short order. It has already been nine months since I brought this matter to the attention of the NRC Commissioners and they referred my 10/7/99 letter to you for action. This is nine months in which I believe the plants have been less safe.

To summarize, it is my understanding that your staff is not presently processing any approval or disapproval of my petition for rulemaking. Your staff is waiting for something to come out of Option 3. Without approval of my petition, the utilities cannot implement changes to make the nuclear electric power units "safer" and more economic with respect to hydrogen control except by the 10CFR50.12 exemption request process. As your staff is aware, some utilities are pursuing the 10CFR50.12 process following the pattern approved in the San Onofre Task Zero. These actions by other utilities are believed necessary because there is no visible action on my petition for rulemaking in spite of your staff's granting the hydrogen control exemptions to San Onofre.

I would like to meet with you to discuss these issues further. I will contact your office to arrange an appointment for such a meeting. In the meantime, please contact me if you have any questions.

Sincerely,



Bob Christie

Cc: Ashok Thadani

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Performance Technology

P.O. Box 51663, Knoxville, Tennessee 37950-1663 Phone: (423) 588-1444, Fax (423) 584-3043
performtech@compuserve.com 865

July 20, 2000

Ms. Cynthia Carpenter
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852-2738

Dear Ms. Carpenter:

I appreciate Tony Markley and you taking the time to talk to me yesterday about my letter to Sam Collins, dated 7/14/00.

My summary of our conversation yesterday is as follows. Sam Collins has now designated you as the individual in NRR that I am to talk to in all matters concerning my petition for rulemaking noticed in the Federal Register on 1/12/00. You indicated Sam Collins does not want to meet with me to discuss my letter of July 14, 2000.

In the telephone conversation, you stated that my petition for rulemaking is a "risk-informed" matter. You indicated that, as stated in the ACRS meeting on June 29, 2000, the evaluation of my petition has been incorporated into Option 3 of SECY-98-300. You believe that Option 3 people are the appropriate people to judge the technical basis of my petition for rulemaking and the Option 3 criteria are the appropriate criteria for evaluation. You do not believe that my petition for rulemaking will be the recommended approach coming out of Option 3 for hydrogen control and therefore personnel from NRR are not evaluating my petition separate from Option 3. When asked what the process would be if Option 3 did not exist, you indicated my petition would have been sent to Research for evaluation.

You indicated that you are constrained by the rules of the NRC with respect to rulemaking and have no other option to follow except the path chosen. When asked, you indicated that there is no benefit for a public meeting for me to discuss this issue with you since you have my letter to Sam Collins. You indicated that Tony Markley is drafting a reply to my letter to Sam Collins and that I will receive this letter after it goes through the concurrence process in NRC. You would give me no schedule for when such a letter would be issued.

In the telephone conversation, I explained that I did not believe the NRR position was the appropriate position to be taken and reiterated my concerns expressed in my letter to Sam

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Collins. My petition for rulemaking is a safety concern first expressed in my letter to the NRC Commissioners, dated 10/7/99. I asked if you had had any discussions recently with Mike Snodderly concerning my safety concerns and you indicated that you had not. I reiterated that my petition was sent to NRR for resolution by the Commissioners and that I agreed to make my letter a petition for rulemaking on the basis of the existing procedures for rulemaking. Again, my petition is not a "voluntary" initiative to be considered in Option 3.

I pointed out the petition for rulemaking was a follow-up to Task Zero at Arkansas Nuclear One and Task Zero at San Onofre and the rulemaking was a better alternative than the exemption request process. You indicated no concern about the licensees having to submit exemption requests under 10CFR50.12, similar to the San Onofre submittal, to make the plants safer and obtain the same decision that would be gained by the approval of the petition for rulemaking.

All in all, it is clear that months ago NRR personnel determined a course of action for evaluation of my petition for rulemaking and that this course of action involved Option 3 rather than usual practices. It does not appear that there is anything that I can say or do for you to change this position. I assume that you are taking this course of action with the complete approval of you supervisors.

As I indicated in the telephone conversation, I am very dissatisfied with the course of action taken by NRR. My petition addresses a safety concern that is documented in the Task Zero at Arkansas Nuclear One and the Task Zero at San Onofre and in public meetings and letters to the NRC. Every day that the NRC delays the approval of my petition is another day in which I believe the nuclear electric power units are less safe. My petition for rulemaking should be evaluated by the usual practices of the NRC for rulemaking which is what NRR staff and I agreed to last year. There are much better ways to "risk-inform" the regulations than Option 3. One of these better ways is to use the usual practices.

I am now waiting for a reply for my letter to Mike Snodderly, dated 7/3/00, and a reply to my letter to Sam Collins, dated 7/14/00..

Sincerely,


Bob Christie

cc: William D. Travers
Samuel J. Collins
Ashok Thadani

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Performance Technology

P.O. Box 51663, Knoxville, Tennessee 37950-1663 Phone: (423) 588-1444, Fax (423) 584-3043
performtech@compuserve.com 865

July 19, 2000

Dr. Ashok Thadani
Office of Research
U. S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD 20852-2738

Dear Dr. Thadani:

During your staff's presentation on the "Risk-Informed Part 50 Framework" to the Advisory Committee on Reactor Safeguards on July 12, 2000, your staff identified four "issues" that are to be sent to the NRC Commissioners for guidance as part of your report to the Commissioners due in August, 2000. These are.

1. Should selective implementation within a regulation of the technical requirements be allowed?
2. Should safety enhancements be required to pass backfit rule?
3. Should there be a reverse backfit test for burden reduction?
4. Role of Safety Goals? (not on slides used but added by Dr. King in presentation).

I wish to comment on issues #2, #3, and #4 because I believe you should accurately describe these issues to the Commissioners. In this vein, I recommend that you read the transcript of the discussion I had with the ACRS Subcommittee on Probabilistic Risk Assessment during their meeting on July 11, 2000.

Issue #2 (backfit) and issue #4 (Safety Goals) are to me the same issue and my comments on these two issues are contained in Attachment 1. My comments on issue #3 (reverse backfit) are contained in Attachment 2.

The following is a summary of my comments.

With respect to issues #2 (backfit) and #4 (Safety Goals).

The Part 50 Framework document called Draft, Revision 0, dated April 2000:

- a. Ignores the standard of "adequate protection" which is the legal basis for the licensing of existing plants.

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- b. Ignores the direct instruction from the NRC Commissioners to consider the backfit rule in any attempt to change the regulations to implement the Safety Goals at existing nuclear units. See Attachment 1, Section A.
- c. Uses a partitioned objective to risk-inform the regulations for the existing nuclear electric power units that the NRC Commissioners stated was to be used for evolutionary design. See Attachment 1, Section B.
- d. Uses partitioned objectives to change the regulations that in effect require risk-informed regulations to be written to a level below "how safe is safe enough." See Attachment 1, Section C.

With respect to issue #3, the NRC staff is asking the Commissioners for direction on the "issue of reverse backfit" when there is no issue of reverse backfit. See Attachment 2.

I believe that it would be worth while for me to discuss my comments on this subject with you in person before you send your report to the NRC Commissioners in August, 2000. I will be contacting your staff in the near future to arrange such a meeting.

Sincerely,



Bob Christie

cc: Sam Collins (Office of Nuclear Reactor Regulation)
Dana Powers (Advisory Committee on Reactor Safeguards)

Attachment 1

Letter from Bob Christie to Dr. Ashok Thadani dated 7/19/00

The use of Safety Goals and Backfitting in enhancing existing regulations

All of my following comments are based on the Framework Document that is designated Draft, Revision 0, April 2000, with the NRC authors listed as Mary Drouin and Alan Kuritzky and a host of people from Sandia National Laboratories and Brookhaven National Laboratory.

The Framework for Risk-Informing the Technical Requirements of 10CFR presently being used by the NRC staff indicates that "Established quantitative health objectives (QHOs) and related subsidiary quantitative objectives will be used to guide the development of risk-informed regulatory requirements." While the NRC staff state that these quantitative objectives will not appear in the regulations, the NRC staff states that these quantitative objectives will be used to write deterministic regulations that will achieve the levels defined by these quantitative objectives.

As you well know, I have been advocating for a number of years that we make use of the Quantitative Health Effects Objectives (QHOs) from the 1986 NRC Policy Statement on "Safety Goals for the Operation of Nuclear Power Plants" to make the regulations more effective and efficient in providing "reasonable assurance of adequate protection of public health and safety." My effort has become known as the "Whole Plant Study." On the surface, the NRC staff Framework Document appears to have the same objectives that I have been advocating. However, as always, "the devil is in the details." The details of the Framework Document are incompatible with my program and also incompatible with the direction specified by the NRC Commissioners in the use of the Safety Goals to enhance regulations.

The Framework for Risk-Informing the Technical Requirements of 10CFR50 claims to be following a "top down" approach to enhance the regulations but in reality the Framework Documents is a "bottom up" approach based on partitioned objectives that are not related to either "adequate protection" or "how safe is safe enough." The NRC staff claims that the partitioned objectives they want to use are based on the Quantitative Health Effects Objectives and the directions the staff received from the NRC Commissioners in the Staff Requirements Memorandum dated June 15, 1990. As I pointed out to the ACRS Subcommittee on Probabilistic Risk Assessment on July 11, 2000, these claims of the NRC staff are not accurate.

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A. The NRC staff ignores the issue of "adequate protection" and the backfit rule.

In the Framework Document, in Section 2.1, the NRC staff states that the Atomic Energy Act requires the NRC to ensure that nuclear power plant operation provides adequate protection to the health and safety of the public. The staff notes that this requirement is called the "adequate protection" standard or the "no undue risk" standard. What Section 2.1 fails to note is that the NRC can enhance the standard of "adequate protection" by the use of 10CFR50.109, Backfitting. After this description in Section 2.1, defining what is required by the Atomic Energy Act, you find that the NRC staff no longer use the term "adequate protection of public health and safety" but rather the term "protecting public health and safety." The NRC staff in the rest of the Framework Document effectively ignores the concept of "adequate protection" and the backfit rule.

This deliberate action is taken by the NRC staff involved in the writing of the Framework Document in spite of the direct instructions by the NRC Commissioners in the Staff Requirements Memorandum of June 15, 1990, covering implementation of the Safety Goals.

"...6) In order to enhance our regulatory process for the current generation of plants, the Commission believes the staff should strive for a risk level consistent with the safety goals in developing or revising regulations. In developing and applying such new requirements to existing plants, the Backfit Rule should apply."

"...11) The Commission agrees that it must not depart from or be seen as obscuring the arguments made in court defending the Backfit Rule.

These arguments clearly established that there is a level of safety that is referred to as "adequate protection." This is the level that must be assured without regard to cost and, thus, without invoking the procedures required by the Backfit Rule. 1/ Beyond adequate protection, if the NRC decides to consider enhancements to safety, costs must be considered, and the cost-benefit analysis required by the Backfit Rule must be performed. The Safety Goals, on the other hand, are silent on the issue of cost but do provide a definition of "how safe is safe enough" that should be seen as guidance on how far to go when proposing safety enhancements, including those to be considered under the Backfit Rule.

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B. The application of quantitative objectives for evolutionary design to existing nuclear units.

The Framework Document uses a value of less than or equal 0.1 for the Conditional Probability of Early Containment Failure. The NRC Commissioners directed in the June 15, 1990, Staff Requirements Memorandum that this value apply to evolutionary designs, not existing designs.

- 4) ..."The Commission has no objection to the use of a 0.1 Conditional Containment Failure Probability objective for the evolutionary design, as applied in the manner described above.

C. Partitioned Objectives.

It has been demonstrated through analysis (Probabilistic Risk Assessment) of each nuclear unit in the United States that the public health risk of each nuclear unit is unique to each unit. Each nuclear unit has a unique public health risk profile that is impacted by each unit's personnel, equipment, procedures, maintenance, operation, site location, meteorology, population density, etc. Each unit, through its Probabilistic Risk Assessment, knows a lot about its risk profile but it is very difficult to generalize such knowledge to all the nuclear units. Because of this unique profile of each nuclear unit, it is very difficult to partition any overall standards. Each nuclear unit has a unique way of meeting the standard of adequate protection or meeting the standard of how safe is safe enough.

The NRC Commissioners were very aware of the unique characteristic of public health risk from nuclear power plants both when they published the 1986 Policy Statement on Safety Goals and when they issued the June 15, 1990 Staff Requirements Memorandum.

In the 1986 Policy Statement, the NRC Commissioners deliberately defined only two Quantitative Health Effects Objectives. The Commissioners deliberately did not set any performance guideline for core damage frequency or containment conditional failure probability. In the 1986 Policy Statement the Commissioners directed the Staff to investigate the possibility of setting a performance guideline such that the overall mean frequency of a large release of radioactive material to the environment from a reactor accident should be less than 1 in 1,000,000 per year of reactor operation. The NRC staff later determined that this performance guideline was not compatible with the Quantitative Health Effects Objectives.

Goal allocation of higher tier objectives to lower tier objectives is very difficult. Goal allocation can be successful if the lower level objectives are derived directly from the higher tier objectives and do not create a new higher tier level objective. If done

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correctly, these lower tier objectives can simplify the process and still lead to the correct decisions. If done incorrectly, these lower tier objectives lead to logical inconsistencies which complicate the decision process and lead to incorrect decisions.

In the June 15, 1990, Staff Requirements memorandum, the NRC Commissioners gave some direction for the use of "partitioned" objectives.

"Implementation of the safety goal may require development and use of 'partitioned' objectives. In general, the additional objectives should not introduce additional conservatisms. The staff should bring its recommendations on the use of each such subsidiary objective to the Commission in the context of the specific issue for which it would be useful and appropriate, and explain its compatibility with the safety goals. Based upon the NRC's review of a sample of plant PRAs, it appears that these plants not only meet the quantitative health effects objectives but exceed them. This may or may not reflect excessive conservatism in regulations. While there have been improvements in PRA techniques, uncertainties in the summary results are still such that quantitative PRA objectives should not be used as licensing standards or requirements.

The Commission believes that the safety goal objectives should be applied to all designs, independent of the size of containment or character of a particular design approach to the release mitigation function. Accordingly, for the purpose of implementation, the staff may establish subsidiary quantitative core damage frequency and containment performance objectives through partitioning of the Large Release Guideline. These subsidiary objectives should anchor, or provide guidance on 'minimum' acceptance criteria for prevention (e. g. core damage frequency) and mitigation (e.g. containment or confinement performance) and thus assure an appropriate multi-barrier defense-in-depth balance in design. Such subsidiary objectives should be consistent with the large release guideline, and not introduce additional conservatism so as to create a *de facto* new Large Release Guideline.

A core damage probability of less than 1 in 10,000 per year of reactor operation appears to be a very useful subsidiary benchmark in making judgments about that portion of our regulations which are directed toward accident prevention.

...The Commission has no objection to the use of a 0.1 Containment Conditional Failure Probability for the evolutionary design, as applied in the manner described above.

...These partitioned objectives are not to be imposed as requirements themselves but may be useful as a basis for regulatory guidance."

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In Section 3.3 of the Framework Document, it is stated. "...The quantitative health objectives are the highest-level quantitative goals. The QHOs were originally set as a measure of 'safe enough.' Given this position of the Commission, there are no risk arguments for setting subsidiary quantitative objectives more stringent than the QHOs."

However, the Framework Document uses three partitioned quantitative objectives for guidelines for writing new regulations for the existing nuclear units.

1. Core damage frequency less than or equal 1.0 E-4 .
2. Conditional Probability of Early Containment Failure of less than or equal 0.1.
3. Large Early Release Frequency of less than or equal 1.0 E-5 .

All of the existing nuclear electric power units in the United States have been licensed to the standard of "reasonable assurance of adequate protection of public health and safety." All existing nuclear electric power units meet this standard. As stated in the June 15, 1990 Staff Requirements Memorandum issued by the NRC Commissioners, it is believed that all of the existing nuclear electric power units in the United States are lower on a risk scale than the Quantitative Health Effects Objectives though no one knows this for sure. What is known, is that many of the existing nuclear electric power units in the United States do not meet one or more of the three quantitative objectives being used in the Framework Document. It is clear that using these partitioned quantitative objectives for guidelines for writing new regulations would be requiring nuclear units to go below "how safe is safe enough"

For example: as stated in the ACRS letter from R. L. Seale to Shirley Ann Jackson, May 11, 1998, "Elevation of CDF to a Fundamental Safety Goal, and Possible Revision of the Commission's Safety Goal Policy Statement."

"...Observation 2. Results of analyses indicate that a CDF of 1.0E-4 per reactor year, if applied to all plants with their current level of containment performance, in many cases would be more conservative than the QHOs. This would, therefore, be a new *de facto* fundamental safety goal."

I believe that the same statement could be made of the other two partitioned quantitative objectives. The Framework Document states the proper use of the QHOs in Section 3.3 and then violates the statement with the choices for the partitioned objectives.

... / Attachment 1)

Attachment 2
Letter from Bob Christie to Dr. Ashok Thadani dated 7/19/00

"Reverse Backfitting"

In the discussion with the NRC Commissioners on June 20, 2000, Mr. James P. Riccio stated that "if the staff of the NRC tries to impose new requirements, they have to go through a cost/benefit analysis commensurate with the backfit rule. To deregulate, you don't have to do that." Mr. Riccio indicates that this is a disparity. Mr. Riccio states "...when the regulator sees something that is important to safety, that they should be able to act upon it without having to go through the machinations (I assume he means the backfit rule), especially if you're going to allow them (I assume he means the licensees) to deregulate. I (Mr. Riccio) believe in equal treatment. If you are going to allow the deregulation to occur without any safety analysis - sorry, cost/benefit analysis, then the same should be said for imposing new regulations under this rubric."

Some of the staff of the Nuclear Regulatory Commission have started to call this position "Reverse Backfitting." I call it "Avoiding Backfit Analysis."

I also believe in equal treatment. Any change to the NRC regulations that is imposed on licensees, started by anyone, should go through a detailed safety evaluation. Any change to the NRC regulations that is imposed on licensee, started by anyone, should go through a detailed cost/benefit evaluation.

What Mr. Riccio sometimes sees and complains about is a 10CFR50.109, Backfitting analysis for changes to the regulations that the NRC staff initiates. This backfit regulation exists because all the NRC regulations are predicated on "reasonable assurance of adequate protection of public health and safety" and the use of 10CFR50.109 if the NRC staff wishes to go beyond adequate protection. The NRC regulations are not predicated on zero risk. The courts in the United States have made this clear.

The NRC staff has never liked the backfit rule and has always tried to avoid backfit analysis. See the "Report on Backfitting and Licensing Practices at the U. S. Nuclear Regulatory Commission," by James R. Tourtelotte, Chairman, Regulatory Reform Task Force, U. S. NRC, March 11, 1985. A sample from the Report on Backfitting: "The primary purpose of the backfit rule when it was passed on March 31, 1970, was to improve the stability of the licensing process by minimizing the alterations of structures, systems or components of a nuclear power plant after the construction permit has been issued. The rule has been selectively ignored by the staff for nearly 15 years. There is a substantial amount of evidence suggesting that the staff's backfitting practices which have cost consumers billions of dollars have made nuclear plants more difficult to operate and

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maintain, have injected uncertainty and paralyzing delay into the administrative process, and in some instances may have reduced rather than enhanced public health and safety."

After the backfit rule was strengthened in 1988, the impact was not that the staff performed backfit evaluations for changes that the NRC staff initiated. Rather, the impact was that the staff proposed fewer direct changes to the regulations. Over the years since 1988, the NRC learned to avoid the strengthened backfit rule by claiming the change initiated by the NRC staff was necessary to meet "adequate protection," or by getting the licensee to "voluntarily" commit to the change, or by issuing a Regulatory Guide. A regulatory guide is a NRC staff document that is "voluntary." Of course, the fine print in the "voluntary" regulatory guide says that this guide is an acceptable method and other methods are also acceptable to meet NRC staff requirements but any other method must meet at least the requirements of the NRC regulatory guide.

In my opinion, the attempt by the NRC staff to avoid having to perform a backfit analysis when the NRC staff proposes additional requirements to the regulations in Option 3 (voluntary), in spite of the direct NRC Commissioner direction to perform such an analysis (See Attachment 1), is a clear example of how the NRC tries to get around the backfit rule.

When a licensee suggests a change to the regulations, there is a detailed and protracted process of safety evaluations done under either rulemaking or 10CFR50.12, Specific exemptions. I wish it were as easy as Mr. Riccio appears to believe for a licensee to make a change to the regulations. I know about these processes because I have spent the last three years performing these safety evaluations. The process of safety evaluation is a very rigorous and expensive process.

What Mr. Riccio doesn't see is the cost/benefit analysis done by the utilities if a licensee suggests changes to the regulations. From my own experience over the last three years, I can tell you personally that the costs to the licensees of changing the regulations, even when everyone (licensee and NRC staff) agrees that the change will result in a safer nuclear unit, are substantial. Every step of the way through the "Whole Plant Study" has had some cost to the licensees. The meetings with the NRC staff, the analyses performed, the reviews performed, the paperwork submitted, the responses to NRC questions, and all the other actions required to satisfy the staff of the NRC are real costs which are borne by the licensees. If not directly, then indirectly, all NRC staff review of the requested change is paid for by the licensees. For all this expenditure, the licensee has no assurance of success.

From the licensee's perspective, the benefits expected if the change is approved has to be more than all the costs of obtaining NRC approval. In past licensee attempts to "risk-inform" NRC requirements (not even the regulations), the benefits of changes made to the requirements sometimes did not outweigh the costs which is why not many licensees propose risk-informed changes to the regulations.

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Some examples concerning unsuccessful licensee attempts to change the regulations are as follows. At Arkansas Nuclear One, there were two submittals with two negative NRC safety evaluation reports written for changing the time for hydrogen monitoring before the NRC approval letter of September, 28, 1998, for Task Zero at ANO. Before personnel from San Onofre were successful in the San Onofre Task Zero exemption request from hydrogen control requirements, personnel from Waterford 3 tried to obtain the same change and were turned down by the staff of the NRC.

Another example: it has been over seven months since my petition for rulemaking to change 10CFR50.44, was started. This petition for rulemaking is an extrapolation based on the Arkansas Nuclear One Task Zero and the San Onofre Task Zero of the Whole Plant Study both of which were approved by the NRC staff. The latest word from the NRC staff is that my petition will not be the recommended course of action coming out of the Option 3 effort and therefore the NRC staff is not processing my petition for either approval or disapproval. In the meantime, licensees cannot implement changes to make the nuclear electric power units "safer" and more economic with respect to hydrogen control except through the 10CFR50.12 Specific exemption process.

Mr. Riccio has it backward. Even if the regulations didn't require a 10CFR50.109 Backfitting analysis, equal treatment would require that the staff of the NRC perform a detailed backfit cost/benefit analysis for any change in the regulations initiated by the NRC staff, even "voluntary" changes.

Performance Technology

P.O. Box 51663, Knoxville, Tennessee 37950-1663 Phone: (865) 588-1444, Fax (865) 584-3043
performtech@compuserve.com

August 24, 2000

Dr. Ashok Thadani
Office of Research
U. S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD 20852-2738

Dear Dr. Thadani:

I appreciate the time that you and other NRC personnel took to talk to me on August 18, 2000, about Option 3 of SECY 98-300 in response to my letter to you dated July 19, 2000. The meeting was very valuable to me because it allowed me to recognize the differences between what the nuclear industry has been proposing in the Whole Plant Study and what the NRC staff is now proposing in Option 3. Clearly, there are major differences between the respective approaches. My summary of the respective positions and differences as discussed in the meeting is as follows.

The objective of Option 3 is for NRC personnel to write a set of deterministic regulations for existing nuclear electric power units in a manner that will assure that the public health risk to individuals and society from these nuclear units is below (more restrictive), on a risk graph, the risk level defined by the Quantitative Health Effects Objectives ("how-safe-is-safe-enough") of the 1986 NRC Policy Statement on Safety Goals for Operating Nuclear Power Plants. The key principles are "defense-in-depth," "safety goals," and "uncertainty." The implementation of the Option 3 objective is accomplished by writing regulations that are based on separate "partition factors" (defense-in-depth) that, when taken in the aggregate, guarantee that the public health risk is below the Quantitative Health Effects Objectives (safety goals) by a substantial margin (uncertainty). This program is "voluntary" except that if regulations are added to achieve the Option 3 objective and the added regulations meet the criteria of 10CFR50.109, Backfitting; then the added requirements may be mandatory.

The objective of the Whole Plant Study is to use insights from Probabilistic Risk Assessments to change the existing regulations for existing nuclear electric power units to achieve "reasonable assurance of adequate protection of public health and safety" in a more effective and efficient manner (regulations will address significant risk items by cost effective means). The key principles are "adequate protection;" 10CFR50.109, Backfitting; and the Quantitative Health Effects Objectives ("how-safe-is-safe-enough"). The implementation of the Whole Plant Study objective is accomplished by retaining

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portions of existing regulations that are effective and efficient (adequate protection); deleting portions of existing regulations that are not effective and efficient; and, where appropriate, adding regulations that meet the criteria of 10CFR50.109; except that no regulations are added below the risk level of "how-safe-is-safe-enough."

To me it is clear that there are major differences between the two approaches. The objectives are different, the key principles are different, and the implementation strategies are different. The only common element may be the use of insights from Probabilistic Risk Assessments. The Quantitative Health Effects Objectives of the 1986 NRC Safety Goal Policy Statement and 10CFR50.109, Backfitting, are used in each program but their use is drastically different in such a manner that I hesitate to say these items are common to each program. In my opinion, the most important difference in the programs is that Option 3 does not accept the concept that substantial compliance with the existing regulations provides "reasonable assurance of adequate protection of public health and safety" while this concept is the starting point for the work in the Whole Plant Study. The implementation of regulations based on the recommended Option 3 "partition factors" would represent a "ratcheting" of the level of safety of nuclear electric power units to a standard more restrictive than that which the Commission has defined as "safe enough."

I believe the discussion we had on August 18, 2000, was very beneficial to all concerned. Again, thank you for taking the time to discuss this matter with me.

Sincerely,



Bob Christie

cc: Samuel J. Collins, NRR
Dr. Dana Powers, ACRS