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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

513th MEETING

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WEDNESDAY,
JUNE 2, 2004

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ROCKVILLE, MARYLAND

The committee met at the Nuclear
Regulatory Commission, Two White Flint North,
Room T2B3, 11545 Rockville Pike, at 8:30 a.m.,
Mario V. Bonaca, Chairman, presiding.

COMMITTEE MEMBERS PRESENT:

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

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1 ACRS STAFF PRESENT:

2 JOHN T. LARKINS, Executive Director

3 SAM DURAISWAMY

4 MARVIN D. SYKES

5

6 ALSO PRESENT:

7 STEVEN A. ARNDT

8 KURT COZENS, NRR

9 JERRY DOZIER, NRR

10 FRANK GILLESPIE, NRR

11 DONNIE HARRISON, NRR

12 HOSSEIN G. HAMZEHEE

13 P.T. KUO, NRR

14 DAVID MATTHEWS, NRR

15 EILEEN MCKENNA, NRR

16 TONY PIETRANGELO, NEI

17 TIMOTHY REED, NRR

18 STEVE WEST, NRR

19 JERRY WILSON, NRR

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

(8:30 a.m.)

CHAIRMAN BONACA: Good morning. The meeting will now come to order.

This is the first day of the 513th meeting of the Advisory Committee on Reactor Safeguards. During today's meeting the committee will consider the following: Draft Final 10 CFR 50.69, Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors; revised license renewal review process; discussion of topics scheduled for meeting with the NRC Commissioners; digital instrumentation and control system research activities; and preparation of ACRS reports.

In addition, the committee will meet with the NRC Commissioners between 1:30 and 3:30 p.m., at the Commissioners' Conference Room, One White Flint North, to discuss items of mutual interest.

Dr. John Larkins is the Designated Federal Official for the initial portion of the meeting.

We have received no written comment or request for time to make oral statements from members of the public regarding today's sessions. A transcript of portions of the meeting is being kept, and it is requested that the speakers use one of the

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1 microphones, identify themselves, and speak with
2 sufficient clarity and volume, so that they can be
3 readily heard.

4 I will begin with some items of current
5 interest. First of all, you have in front of you a
6 package with items of interest. You may note in the
7 first enclosure in the package is a Staff Requirements
8 Memorandum directing the staff to recover the MSPI
9 index. You may be interested by that SRM.

10 This package also contains a number of
11 speeches and correspondence, and among the
12 correspondences should be interested by the letter
13 from Chairman Diaz to the Chairman of Vermont Public
14 Service Board committing the staff to perform a
15 special review of Vermont Yankee. And in that
16 commitment, there is also a statement of the role that
17 the ACRS will play, so you may want to go into that
18 and look at that.

19 I also would like to make two
20 announcements. First, Mr. Cayetano -- or "Tany" --
21 Santos has joined the ACRS staff on June 1, 2004.
22 Prior to joining the ACRS staff, he was working for
23 the Office of Nuclear Regulatory Research as a
24 Materials Engineer. He has a B.S. degree in Materials
25 Engineering from the University of Florida, and an

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1 M.S. degree in Materials Engineering from the
2 University of California-Santa Barbara. He will be
3 replacing B.P. Jain, who left ACRS staff to join RES.

4 Welcome, Mr. Santos.

5 (Applause.)

6 Also --

7 MEMBER APOSTOLAKIS: Do we have any
8 materials issues? Why do we need Mr. Santos?

9 (Laughter.)

10 CHAIRMAN BONACA: Yes. He's going to be
11 a victim of our Materials Subcommittee. I mean, he's
12 going to work very hard to --

13 MEMBER POWERS: Hopefully, he can
14 straighten that committee out.

15 CHAIRMAN BONACA: Also, I would like to
16 welcome Dr. Flack, who will be joining the ACRS as a
17 senior staff -- senior technical advisor on July 11,
18 2004. Dr. Flack is currently the Branch Chief for the
19 Advanced Reactor and Regulatory Effectiveness Branch
20 in the Office of Nuclear Regulatory Research.

21 Dr. Flack has over 22 years of nuclear
22 safety experience and first joined the NRC as an ACRS
23 fellow in 1984. In 1986, he was transferred to the
24 Office of Nuclear Regulatory Research as a Risk
25 Assessment Engineer, and later led the NRC review of

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1 licensees' individual plant examinations.

2 In the mid 1990s, he served as Acting
3 Branch Chief of the Probabilistic Safety Assessment
4 Branch in NRR, and later as Branch Chief of the
5 Regulatory Effectiveness and Human Factors Branch in
6 RES.

7 Dr. Flack received a B.S. degree in
8 Mechanical Engineering from Richmond College, New
9 York, an M.A. in Physics from Queens College in New
10 York, and a Ph.D. in Physics from the University of
11 Hawaii.

12 Dr. Flack, welcome aboard.

13 DR. FLACK: Thank you.

14 (Applause.)

15 CHAIRMAN BONACA: With that, introductions
16 are over, and we can move to the first item on the
17 agenda. That is Draft Final 10 CFR 50.69, and
18 Professor Apostolakis will lead us through.

19 MEMBER APOSTOLAKIS: Thank you, Mr.
20 Chairman.

21 The purpose of our meeting today is to
22 review the draft final rulemaking package for 10 CFR
23 50.69. 10 CFR 50.69 has been developed to permit
24 licensees to implement an alternative regulatory
25 framework with respect to special treatment where

1 "special treatment" refers to those requirements that
2 provide increased assurance beyond normal industrial
3 practice that structures, systems, and components
4 perform their design basis functions.

5 Under this framework, licensees use --
6 using a risk-informed process for categorizing SSCs
7 according to their safety significance, can remove
8 SSCs of low safety significance from the scope of
9 certain identified special treatment requirements.

10 Report NEI 00-04 was written in support of
11 the rule, and the staff has conditionally endorsed it
12 in Regulatory Guide 1.201. The focus of today's
13 briefing will be on the regulatory guide exemptions,
14 issues raised during our subcommittee meeting of
15 February 19, 2004, and resolution of public comments
16 as discussed in Section 2 of the statement of
17 considerations.

18 The committee's most recent action on this
19 matter was review and comment upon draft rule language
20 for 10 CFR 50.69 and proposed industry guidance in
21 Revision B to NEI 00-04. The committee's letter dated
22 March 19, 2002, had several conclusions and
23 recommendations, which include the following.

24 Criteria used by the integrated
25 decisionmaking panel for categorizing SSCs should be

1 made explicit and should include consideration of risk
2 metrics that supplement core damage frequency and
3 large early release frequency, such as late
4 containment failure and inadvertent release of
5 radioactive material.

6 Materials degradation is not directly
7 assessed in NEI 00-04 Revision B. We recommended that
8 the aging phenomena and the management of degradation
9 must be considered in the IDP deliberations concerning
10 affected SSCs and passive system components.

11 NEI 00-04 Revision B shied away from
12 providing guidance or encouragement for licensees to
13 perform uncertainty analyses, and relied heavily on
14 sensitivity studies. The committee recommended that
15 uncertainty analysis should be performed where
16 possible.

17 The committee felt that the justification
18 for increasing failure rates in NEI 00-04 Revision B
19 was weak and better justification was required.

20 We also refer to our earlier report dated
21 October 12, 1999, where we commented extensively on
22 the decisionmaking process and the need for guidance
23 and training in conducting expert panel sessions, and
24 we also had some comments on the limitations of
25 importance measures.

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1 After today's briefing, we are expected to
2 write a report to the Commission with our comments on
3 the draft final 10 CFR 50.69.

4 And with that, we can start now. Tim?

5 MR. REED: Thanks George.

6 I'm Tim Reed from NRR, and I have with me
7 today Donnie Harrison, also from NRR, and quite a bit
8 of help in the room -- Tom Scarbrough from Engineering
9 and others here to help out. So I think we have
10 enough people to answer any question that the
11 committee might have.

12 As George already mentioned, the objective
13 today is to achieve a letter of endorsement from the
14 ACRS full committee on 50.69 as we go forward to
15 provide the rulemaking to the Commission here on 6/30.
16 The discussion also, consistent with what George has
17 mentioned, will focus on any changes that have
18 occurred in the package since we last talked to the
19 ACRS, which was back in February of this year, 2004,
20 the Subcommittee on PRA and Risk. And we'll focus on
21 any changes that occurred in the package since we
22 provided the package that's before you on May 17th.

23 And then, the focus of the discussion will
24 be primarily on the Reg Guide 1.201, formerly 1121,
25 and the remaining issues we have with the

1 implementation guidance N00-04. So that's what we
2 intend to focus on today, but, of course, we can
3 answer any questions that the committee might have.

4 George mentioned we met with the committee
5 on February 19th, the Subcommittee on Reliability and
6 PRA. That briefing focused on public comment review
7 and its resolution, as well as on the NEI 00-04 review
8 status and our efforts to develop a draft Reg Guide.

9 With regard to the public comment review,
10 and the responses and the issues that we presented on
11 those slides, the positions that we took on those
12 slides have all been implemented in the package
13 without any changes. So you should see all those in
14 the package, and there have been no changes at all in
15 those technical positions.

16 So that's the first agenda item. I wanted
17 to point out that we're consistent with what we said
18 back in February.

19 We do have one noteworthy change, though,
20 to the package, since we provided it to you on
21 May 17th, and that is with regard to who may adopt
22 50.69. During the concurrence process, and a little
23 more in-depth analysis, we identified one pretty
24 difficult issue to resolve. And that involves
25 applicants for a Part 52 design certification, so

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1 right now we're going to not allow those to adopt
2 50.69.

3 And this is really a result of some
4 fundamental discontinuities, if you will, between
5 Part 52 and 50.69. I'm sure this committee is
6 familiar with Part 52 and the way it works in design
7 certifications, and the way that it has become a rule
8 basically in Part 52. And there are some very tight
9 change control restrictions in Part 52, and the
10 thought here and the concern here is if a vendor were
11 to take that design all the way past first -- first,
12 two initial criteria to adopt 50.69 must be a light
13 water reactor; and, two, must be designed from safety-
14 related and non-safety-related as a first start in
15 50.2 of Part 50.

16 The next thing, though, once you're past
17 that, then you're in the door. You can actually
18 consider 50.69 now. In Part 52 now, if the vendor
19 were to go all the way to -- past safety-related and
20 non-safety-related, and take it to the -- what I call
21 the overlay, the 50.69 overlay, and put the SSCs
22 actually into the four boxes, it is our concern that
23 Part 52 would lock those into those four boxes,
24 because of the nature of change control in Part 52.

25 As the committee is aware, 50.69, on the

1 other hand, is a living regulation, and a very, very
2 important part of 50.69 is the monitoring and feedback
3 in paragraph E, and its PRA updates and the
4 performance information that can be fed back as you go
5 through time.

6 Both of those can result in SSCs changing
7 boxes, and we would expect that to occur but not to
8 any great extent. But nonetheless, it can occur.
9 That seems to be diametrically opposed to Part 52, so
10 this is a problem that as of right now we don't have
11 a solution for.

12 But if we get interest from a design
13 certification applicant who wants to go take it that
14 far and apply 50.69, we'll have to address it at that
15 time on a case-by-case basis, and would probably take
16 some pretty clever rulemaking language, at a minimum,
17 to solve it. And then we'll have to revisit and see
18 whether we can fix Part 52 or 50.69 at that time. But
19 as of right now, we'd have to do that on a case-by-
20 case basis.

21 MEMBER APOSTOLAKIS: So let me understand
22 this process. When somebody submits an application
23 for design certification, do they actually identify
24 safety-related and non-safety-related SSCs?

25 MR. REED: They can, yes. I mean,

1 certain --

2 MEMBER APOSTOLAKIS: But they don't have
3 to.

4 MR. REED: They don't have to. Jerry,
5 start correcting me if I'm off the path here. But,
6 yes, they certainly can. I think we have several
7 designs right now that do, in fact, do that that are
8 approved.

9 MR. WILSON: This is Jerry Wilson, NRR.
10 The answer to your question is yes. As you understand
11 with 50.69, it's basically a two-step process. First,
12 you have to categorize your equipment in safety-
13 related or non-safety-related, and also retaining the
14 design bases.

15 And then, if an applicant referencing a
16 certified design chose to adopt the 50.69 process they
17 could voluntarily do that, and then they would do the
18 additional categorization into the four boxes.

19 MR. REED: Yes. What Jerry is talking
20 about is --

21 MR. WILSON: We have to go through those
22 steps.

23 MR. REED: -- actually the second bullet
24 I have up here, which says combine operating license
25 applicants -- in fact, can do this.

1 MEMBER APOSTOLAKIS: So they would have to
2 do it after they receive it.

3 MR. REED: Right, exactly. They're
4 exactly analogous to a current licensee. I look at
5 the COL guys as the current licensee, and the vendor
6 for the design cert is like the --

7 MEMBER APOSTOLAKIS: Okay.

8 MR. REED: -- today, you know, and
9 basically they would apply it the exact same way. The
10 problem happens is when the vendor designer puts it in
11 the boxes, in the four RISC boxes. That's the
12 problem, because it locks it in in place, according to
13 Part 52 change control restrictions.

14 MEMBER APOSTOLAKIS: Well, but --

15 MR. REED: And that's the problem right
16 there.

17 MEMBER APOSTOLAKIS: They can apply 50.69
18 after certification.

19 MR. REED: Yes. Yes.

20 MEMBER APOSTOLAKIS: But, I mean, why
21 don't the restrictions of 52 apply then?

22 MR. WILSON: Jerry Wilson. The design
23 information that's supporting the design certification
24 restrictions do apply to that. But this additional
25 process in the recategorization would take place

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1 during the combined license review and be in the
2 additional information with the combined license
3 application, and, therefore, would not be controlled
4 by the special restrictive change process for design
5 certification, but rather would be controlled by the
6 normal change process you would have for other
7 operating plants.

8 MR. REED: Yes. I look at it as like --
9 as if the design cert would control what I call design
10 basis functional requirements. That's what we
11 understand today in Part 50.

12 And then the COL guy would be able to do
13 the overlay. That works.

14 MEMBER APOSTOLAKIS: But 50.69, though,
15 preserves the design requirements, right?

16 MR. REED: Absolutely.

17 MEMBER APOSTOLAKIS: So it doesn't really
18 matter.

19 MR. REED: For COL. For COL guys. The
20 problem -- it's actually a regulatory discontinuity
21 between Part 52 and 50.69. If the applicant for
22 design cert puts them in the boxes, that's when the
23 problem results.

24 MR. HARRISON: See, because what you could
25 have happen is you could have -- the vendor puts it

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1 into the four boxes as part of the design cert. Those
2 now are locked into those places. So if I do a PRA
3 update in the future, and something needed to move, I
4 couldn't move it anymore.

5 MEMBER APOSTOLAKIS: Why not?

6 MEMBER ROSEN: Why is this a problem at
7 all? Why don't you just say --

8 MEMBER APOSTOLAKIS: I don't understand
9 it.

10 MEMBER ROSEN: Why don't you just say you
11 can't do that, you have to apply for --

12 MR. REED: Well, that's exactly what we've
13 done.

14 MEMBER ROSEN: Well, I've heard design
15 certification, you get it, and then if you choose to
16 you could ask for a license amendment, just like an
17 operating plant, to apply 50.69. And it would likely
18 be granted, and then you go ahead and do it.

19 MR. REED: And that's the solution path
20 we've taken.

21 MEMBER APOSTOLAKIS: But what does it mean
22 you can't move it? I mean, 50.69 does not affect the
23 design functions, does it?

24 MR. HARRISON: Well, what happens is is
25 the -- it may be -- I don't know -- a terminology

1 problem, but once you say something is RISC-3 --

2 MEMBER APOSTOLAKIS: Yes.

3 MR. HARRISON: -- in design cert, under
4 Part 52 it's RISC-3, and it's got that -- it can't go
5 back to RISC-1.

6 MEMBER APOSTOLAKIS: But isn't that in
7 conflict with what Tim said about 50.69 being a
8 living --

9 MR. REED: No. Again, this is --

10 MR. HARRISON: That's exactly the
11 conflict.

12 MEMBER ROSEN: That's the disconnect
13 between Part 52 and this Part 50 --

14 MR. REED: The way Part 52 works and locks
15 things into place, if it's an approved design
16 certification, versus 50.69, so the way to do it is to
17 have the COL applicant take the approved certification
18 off the shelf and reference it, and then they can use
19 it. It's just --

20 MR. MATTHEWS: Let me interject here. Let
21 me interject. This is David Matthews. I'm the
22 Director of the Division of Regulatory Improvement
23 Programs.

24 I think the trouble comes when these --
25 when they say "locked in," what they mean is that when

1 we certify a design under Part 52, we issue a rule
2 certifying that design, and that's the problem. The
3 design, if it were to go so far as to adopt the
4 terminology and the categorization of Part 50.69, then
5 those design attributes, okay, that would result in
6 risk categorization would be included in the design
7 certification rule.

8 And where the restriction comes in is once
9 you get a design certification rule, the restrictions
10 in the rule are such that it can't be changed. So the
11 Commission decided, as some protection against backfit
12 provisions, okay, to have very restrictive change
13 mechanisms on design certification to protect the
14 industry from the NRC's inclination to want to change.

15 But it also restricts the industry, if
16 they choose to want to change their design
17 certification rule from changing it, other than
18 through another rule change, which would be a petition
19 for rulemaking.

20 So that's what they mean by "lock in."
21 And so if somebody goes so far as to apply 50.69 I'll
22 say prematurely, before they get their design
23 certification, then their design certification locks
24 them into their categorization. If they wait until
25 after their design certification, and sell it to an

1 applicant, then that applicant can apply 50.69 to its
2 implementation.

3 MEMBER ROSEN: But nothing prevents the
4 designer from asking for design certification and
5 doing the categorization work up front, simply not
6 asking for the change. He could show that to his
7 clients.

8 MR. MATTHEWS: Absolutely.

9 MEMBER ROSEN: He can say, "This is where
10 we're going to end up."

11 MR. MATTHEWS: Absolutely.

12 MEMBER ROSEN: "As soon as you buy this
13 plant from us" --

14 MR. MATTHEWS: He can do that work ahead
15 of time.

16 MEMBER ROSEN: -- "a license, we'll apply
17 for 50.69." And then all of this equipment, which is
18 currently safety-related, will stay safety-related.
19 But it will be not risk-significant or low safety
20 significance.

21 MR. MATTHEWS: Right. And that work can
22 be done ahead of time. He just has to be careful
23 about asking our endorsement for it in the design
24 certification rule.

25 MEMBER ROSEN: Right.

1 MEMBER APOSTOLAKIS: But is the PRA during
2 the design certification process complete enough to
3 allow for a categorization? Without having a site --

4 MR. REED: That's an excellent question,
5 because I think you'd have to have, for example, in
6 the pressure boundary categorization -- you'd have to
7 have a lot of information about the plant --

8 MEMBER APOSTOLAKIS: Right.

9 MR. REED: -- for example, to be able to
10 do that piece of it. I don't know exactly how -- to
11 be honest with you, Jerry, maybe other people familiar
12 with Part 50 know how good these PRAs are, whether
13 they're good enough.

14 MR. WILSON: Well, for the purpose of the
15 design review, they've been sufficient. But until
16 you've procured the equipment, I mean, the reliability
17 information is an assumption. So it would work much
18 better if you knew that --

19 MEMBER APOSTOLAKIS: So it seems to me
20 that that would be a major reason for not applying
21 50.69 to --

22 MEMBER ROSEN: George, you wouldn't have
23 the details of the cooling water supplies, especially
24 essential cooling water, which was likely to be high
25 risk-significant and safety-related, because you don't

1 -- that depends on the site. And so you --

2 MEMBER APOSTOLAKIS: You wouldn't have the
3 external events.

4 MEMBER ROSEN: You wouldn't have the
5 external events.

6 MEMBER APOSTOLAKIS: You wouldn't have --

7 MEMBER ROSEN: You wouldn't have any
8 knowledge of that either. So the logical time is
9 after the site is designed and certified, and the site
10 is identified, and then you do a -- do the remainder.

11 MEMBER APOSTOLAKIS: Well, yes, I
12 understand that.

13 MR. REED: Right. That's what we allow.

14 MEMBER APOSTOLAKIS: I was confused about
15 what 52 does and 50.69 can do. But I guess it's okay.
16 I mean, if it --

17 MEMBER ROSEN: No, this doesn't trouble me
18 at all. If this is the way --

19 MEMBER APOSTOLAKIS: It doesn't trouble me
20 either. I'm just trying to understand it.

21 MR. REED: All right.

22 MEMBER APOSTOLAKIS: Okay. Let's go on.

23 MR. REED: Well, that's the one noteworthy
24 change. Basically, everything else in that package
25 that has changed since May 17th has been editorial,

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1 and there have been no significant technical changes.
2 So what you've reviewed is, in fact, what remains to
3 this day.

4 And as of right now, all offices, with the
5 exception of OGC, have concurred, and they are
6 actively looking at it right now to consider whether
7 they concur or not. And I don't know of any legal
8 objections, as of right now, to the package.

9 What we've got remaining, then, also is we
10 are right now interacting with CRGR to determine
11 whether we're going to meet with them. If we do meet
12 with them, it will be on June 17th. Of course, there
13 are no backfits in this package. This is an
14 alternative -- voluntary alternative, and so we are
15 trying to get that CRGR meeting weighed for that basic
16 reason.

17 We are scheduled to provide this
18 rulemaking package to the EDO on June 23rd, and then
19 the EDO is, in turn, supposed to provide it to the
20 Commission on June 30th. We are currently on schedule
21 to do just that.

22 As I think the committee probably has
23 recognized, the package contains Reg Guide -- now Reg
24 Guide 1.201. It's our intent as of right now to issue
25 that for trial use and update and revise it with the

1 lessons learned from Surry and the Wolf Creek pilots,
2 which are ongoing pilots.

3 And that brings me to the next speaker,
4 which will focus on the Reg Guide 1.201 issues, what
5 remains, and what we plan to do with that.

6 Before we go to Donnie, I guess I'll just
7 ask if there's any questions on what I've presented so
8 far to the committee.

9 MEMBER APOSTOLAKIS: Well, yes, I have a
10 question.

11 MR. REED: Sure.

12 MEMBER APOSTOLAKIS: The rulemaking
13 package goes to the Commission the end of the month,
14 and then presumably the Commission will vote on it
15 some time afterwards, right?

16 MR. REED: I would anticipate that the
17 Commission probably 10 days later will issue it for
18 public -- make it public. And then, at some point,
19 the Commission will vote on it. In the past, it has
20 been -- it has taken quite a bit of time, to be honest
21 with you. The last two times it has taken on the
22 order of about six months.

23 I don't think the Commission will take
24 that long this time. I expect them to act reasonably
25 quickly, but I do expect them to let -- put it in the

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1 public domain and get some feedback there, I would
2 expect. But that's just speculation on my part.

3 MEMBER APOSTOLAKIS: Now, the regulatory
4 guide, though, you said would be issued for trial use.
5 So that means what, that maybe a year later the guide
6 can be revised, but the rule will be the rule, right?

7 MR. HARRISON: Right. Right, yes. The
8 expectation is is we'll -- we'll learn a few things,
9 we'll maybe close the loop on a couple of things, and
10 come up with maybe a template for submittals, provide
11 a final NEI -- a final final NEI 00-04 that will
12 endorse into a final reg guide.

13 MEMBER APOSTOLAKIS: So how long will this
14 process take?

15 MR. HARRISON: I really haven't tried to
16 estimate the time. It --

17 MEMBER APOSTOLAKIS: Two years?

18 MR. HARRISON: No, it shouldn't take --
19 we're actually working with NEI I think fairly closely
20 in closing up the gaps that we do have. It's more of
21 -- Surry is supposed to come in this fall as part of
22 the PRA quality pilots. We're going to look at it at
23 that time, so I'm guessing probably early next year
24 that we'll be coming back with a -- to close up the
25 final pieces of it.

1 MR. REED: In fact, NEI is -- the last
2 time I spoke to NEI they were -- and they can speak to
3 this later on -- they were planning on actually
4 providing another version of NEI 00-04 this Friday.
5 So that may close some of these issues.

6 MEMBER APOSTOLAKIS: That would be
7 Version E?

8 MR. REED: I'm not sure what they'll refer
9 to it as.

10 MR. HARRISON: Were on final draft, so --

11 MR. REED: Final final --

12 MR. HARRISON: -- this would be final
13 final draft.

14 MEMBER ROSEN: -- final final draft, I
15 guess. That's up to NEI. And --

16 MEMBER APOSTOLAKIS: Final-squared.

17 MR. REED: And I think we'll hopefully
18 close a lot of these issues off at that point, and
19 we'll try and switch out at that point and clean it
20 up.

21 MEMBER APOSTOLAKIS: So you will tell us
22 what the issues are today, right?

23 MR. HARRISON: Yes.

24 MEMBER APOSTOLAKIS: Okay.

25 MR. HARRISON: And to be honest with you,

1 there's really only one truly technical --

2 MEMBER APOSTOLAKIS: Yes, you should be
3 honest.

4 MR. HARRISON: Yes, I'll try to be honest.
5 There should be only one technical issue. You know,
6 actually, that brings up a key point, if I can make
7 it. I was reading the --

8 MEMBER APOSTOLAKIS: Honesty does?

9 MR. HARRISON: On honesty, actually. Only
10 in a society where you don't trust people do people
11 have to say they're going to be honest.

12 MEMBER APOSTOLAKIS: Let's not start a
13 philosophical --

14 MR. HARRISON: Just a little, you know,
15 side remark.

16 MEMBER APOSTOLAKIS: That's fine. That's
17 fine. We make side remarks all the time.

18 MEMBER KRESS: In such a society, who
19 would believe such a statement?

20 MR. HARRISON: There you go. That's the
21 point of that point. Okay.

22 MEMBER APOSTOLAKIS: Now, how come your
23 name is not on the cover page? And the --

24 MR. HARRISON: You could argue maybe I'm
25 trying to, you know, disappear in this process. No,

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1 I just -- that was just the way I did the slide.

2 By the way, I'm Donnie Harrison. I'm in
3 the NRR PRA Branch, and I've been working on this
4 since I think Draft C of NEI 00-04. So actually for
5 me it's good to hear you talk about Draft B, because
6 it's a long time since I've even read that stuff.

7 We received the final draft in April. The
8 final draft that we got from NEI incorporated a lot of
9 changes that we had made on Rev. C, back probably
10 almost a year ago or so, and some of the -- they also
11 created a Rev. D kind of as an interim piece before
12 the final draft came out.

13 They either addressed our positions
14 directly within this revision, or in some cases we
15 actually have changed our position that was in the
16 DG-1121, because now we understand better what the
17 process is doing in NEI 00-04.

18 The example that I would give for that
19 would be in the Rev. C we had made the comment that if
20 a component was determined to be high for any reason,
21 including the sensitivity studies, then it should be
22 considered high safety significant.

23 With now our understanding of how the
24 process actually flows, we've backed off on that and
25 said, "No. If it's low in the base case, but a

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1 sensitivity makes it high, that information should go
2 to the IDP. The IDP should look at it, consider the
3 reason why it goes high, and then they can make the
4 final call on if it's high or low." So that's --

5 MR. REED: I think that's the only
6 opportunity for the IDP to have that discretion,
7 right? Is that --

8 MR. HARRISON: Those are the situations
9 where the IDP will actually -- if something is high
10 because of a sensitivity study, they will evaluate it
11 and make a decision.

12 MR. REED: I think otherwise the IDP
13 cannot make anything --

14 MR. HARRISON: Right.

15 MEMBER ROSEN: -- low in any other
16 situation.

17 MR. HARRISON: They can't force it low.

18 MEMBER APOSTOLAKIS: So it has to start
19 low.

20 MR. HARRISON: It has to start low.

21 MEMBER APOSTOLAKIS: The sensitivity --

22 MR. HARRISON: It has to raise it.

23 MEMBER APOSTOLAKIS: -- which now places
24 a lot of burden on the sensitivity studies, does it
25 not? I mean, a sensitivity study is very arbitrary.

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1 I mean, I can raise it by a factor of three. I can
2 take the 95th percentile, as the document recommends.

3 MR. HARRISON: Right.

4 MEMBER APOSTOLAKIS: Whose 95th
5 percentile? You know, there are --

6 MR. HARRISON: Right.

7 MEMBER APOSTOLAKIS: -- many PRAs out
8 there. I can pick one that suits me. So I -- I don't
9 know if that -- why it --

10 MR. HARRISON: Well, and again, that's --
11 there's multiple levels of, I guess you would say,
12 judgment control that are in the guidance. That even
13 -- even if I do the sensitivity studies, and I make
14 things low, I still then have to do the risk
15 sensitivity study, which elevates all of my lows by a
16 factor, and then I have to show that that still comes
17 up with an acceptably small delta risk.

18 So there's -- there's little checks and
19 balances in the process.

20 MEMBER APOSTOLAKIS: Now, the sensitivity
21 studies I don't remember. You are raising --

22 MR. HARRISON: HRA --

23 MEMBER APOSTOLAKIS: -- everything, or
24 just individual classes?

25 MR. HARRISON: It's done by class on the

1 function. It's -- it would be like maintenance on
2 availability, set them to one, or set them to zero.

3 MEMBER APOSTOLAKIS: Yes.

4 MR. HARRISON: Human reliability, and
5 leave the rest as they are. So it's done on the class
6 of -- or grouping of topics.

7 Also within there is, if there was a peer
8 review finding that raised a question on something,
9 they could do a sensitivity study to address the peer
10 review findings.

11 MEMBER APOSTOLAKIS: Now, the sensitivity
12 is not only on parameters, right? Not on models.

13 MR. HARRISON: Not just on the model.

14 MEMBER APOSTOLAKIS: It's not done on the
15 model at all, is it?

16 MR. HARRISON: I guess I'm not following
17 the question.

18 MEMBER APOSTOLAKIS: Well, I mean, again,
19 we talked last time about having two or three
20 different ways of modeling seal LOCAs.

21 MR. HARRISON: Right.

22 MEMBER APOSTOLAKIS: Would that be part of
23 the sensitivity study?

24 MR. HARRISON: Not unless it was brought
25 up as part of a peer review finding.

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1 MEMBER APOSTOLAKIS: Why would the peer
2 reviewers comment on this?

3 MR. HARRISON: Well, it wouldn't be
4 surprising, actually, if someone did a reactor coolant
5 pump seal model that wasn't, if you will, a standard
6 approach, or if a peer reviewer would raise a question
7 about the use of a certain model that maybe wasn't one
8 that had been accepted by the industry. So you could
9 get to it at that point.

10 MEMBER APOSTOLAKIS: I mean, what is the
11 logic behind increasing the failure rate of something,
12 and not waiting for the experts to comment on that?
13 But when there is model uncertainty, we rely on the
14 peer reviewers to tell us that their alternate models
15 here are --

16 MR. HARRISON: Well, that's only one
17 aspect. There's also an aspect in here, which is a
18 position we've taken, which is a couple slides from
19 here, which talks about they still need to address
20 uncertainty. They still have to talk about model
21 uncertainty, identify their key sources of
22 uncertainty, and the process --

23 MEMBER APOSTOLAKIS: I understand that.
24 But, I mean, since they are doing some sensitivity
25 studies already --

1 MR. HARRISON: Right.

2 MEMBER APOSTOLAKIS: -- wouldn't those be
3 naturally -- natural candidates to be included? I
4 mean, there are not very many model uncertainties in
5 Level 1. Now, in LERF there may be many more.

6 MR. HARRISON: You know, I would have
7 agreed with you until I looked at some material the
8 other day and --

9 MEMBER APOSTOLAKIS: What material?

10 MR. HARRISON: This is part of the PRA
11 quality pilot, so the -- the generation of what the
12 key sources of uncertainty -- may be a topic that
13 within the PRA quality pilots we're going to have to
14 look a little harder at, just from the material I
15 started looking at as part of that pilot. They're
16 creating a large list of --

17 MEMBER APOSTOLAKIS: Right.

18 MR. HARRISON: -- uncertainties.

19 MEMBER APOSTOLAKIS: But, again --

20 MR. HARRISON: And then toning down and --
21 what they're coming down to is not what I --

22 MEMBER APOSTOLAKIS: Who is "they"?

23 MR. HARRISON: This is in the Columbia
24 pilot. Again, this is part of the Columbia diesel
25 generator AOT, risk-informed AOT pilot.

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1 MEMBER APOSTOLAKIS: Who is doing the
2 analysis?

3 MR. HARRISON: Well, the licensee did the
4 submittal, with support from a contractor. We have an
5 internal NRR research team reviewing the material, and
6 they created a large list of uncertainties that they
7 then pared down for the submittal. And just a point
8 -- it's just a point of observation that their final
9 list of what they considered to be the key sources of
10 uncertainty for that submittal was not the same list
11 I would have thought of off the top of my head, what
12 would have been on that list.

13 MEMBER APOSTOLAKIS: So why are we relying
14 on the peer reviewers, then, to think of it?

15 MR. HARRISON: Well, this came out of
16 their peer review process, actually. So I'm just
17 saying that that's an evolving thing. I think before
18 I started looking at this material I probably would
19 have agreed with you. Now I want to take the --

20 MEMBER APOSTOLAKIS: So there are going to
21 be uncertainties due to modeling assumptions? Is that
22 the conclusion from this study?

23 MR. HARRISON: Well, it turned -- yes,
24 what's turning out is there are some uncertainties
25 that need to be addressed. What you typically end up

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1 with is no impact, but -- or the impact is small. And
2 so it just -- I'm just saying the topic, like on a BWR
3 that says recirc pump seal LOCAs, is a -- becomes a
4 key uncertainty. I'm not sure if that's really a key
5 uncertainty for that plant, you know, for a BWR.

6 MEMBER APOSTOLAKIS: Yes. But you also
7 have human reliability model uncertainty.

8 MR. HARRISON: Which wasn't on the final
9 list. So, again, this is just --

10 MEMBER APOSTOLAKIS: I'm not saying that
11 these are critical uncertainties, but at least could
12 someone show us a study that demonstrates that they
13 are not significant? See, now I have to speculate.
14 I read the paper, which I'm sure you have seen by Blye
15 and the other guys, that shows how they handle model
16 uncertainty in some PRAs, and the impact was not
17 insignificant.

18 Then, you are telling me somebody else did
19 a study that shows that actually these are not
20 significant uncertainties. And now I'm confused. And
21 we seem to be paying too much attention on things that
22 are fairly straightforward, but then the other things
23 that require a little bit more innovative thinking we
24 push aside, and especially in Level 2 LERF. I mean,
25 even there we just raise failure rates. I don't know

1 what we do then.

2 MR. HARRISON: Well, again, that's going
3 to depend on the approach the licensee takes. But for
4 the most part, you will be doing just that.

5 MEMBER APOSTOLAKIS: I mean, this agency
6 sponsored NUREG-1150.

7 MR. HARRISON: Right.

8 MEMBER APOSTOLAKIS: All these
9 uncertainties were identified, and so on. Are we
10 taking advantage of this?

11 MR. HARRISON: Well, again, I think -- I
12 think we are. It's just that some of, again, what I
13 saw just, you know, a few days ago is making me want
14 to take a step back and -- and look at what the
15 industry has done and saying -- if it makes sense what
16 they've done, then it changes my view on some of the
17 -- you know, I think for PWR reactor coolant pump seal
18 LOCA we would all agree it is a key source of
19 uncertainty. The way we model it is conservative for
20 the most part. And so it's --

21 MEMBER APOSTOLAKIS: Donnie, I'm not
22 doubting these answers. All I'm saying is I haven't
23 seen them.

24 MR. HARRISON: Okay. Fair enough.

25 MEMBER KRESS: But with respect to the

1 sensitivity studies, it's been my observation that
2 sometimes they use one sigma, and sometimes they use
3 two sigma and other values, and sometimes they do it
4 one -- one parameter at a time, and sometimes they do
5 it with all parameters or several important parameters
6 at a time.

7 Is there any -- and you could get a -- get
8 different results with respect to moving one component
9 out of a low to a high, depending on how you did that.
10 Is there any guidance in this NEI 00-04 on how to do
11 sensitivity studies and --

12 MR. HARRISON: What they've done in
13 NEI 00-04 is provide, within each topic -- so if we're
14 doing a fire PRA sensitivity, there's a list of
15 sensitivities that you will do as part of that. Or
16 for the internal events --

17 MEMBER KRESS: One at a time?

18 MR. HARRISON: Actually, the way I read it
19 it was, again, by collective group. So you will move
20 the human reliability values to their 95th.

21 MEMBER KRESS: And the 95th they identify
22 as being two sigma, or do they have -- actually have
23 the distribution --

24 MR. HARRISON: That would be the
25 distribution that comes out of the methodology they

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1 apply. And, again, that becomes -- different methods
2 can get you different distributions.

3 MEMBER APOSTOLAKIS: If I use one method,
4 and I come up with a distribution, that doesn't mean
5 that the distribution I develop includes the results
6 of other methods.

7 MEMBER KRESS: Right. I agree.

8 MEMBER APOSTOLAKIS: Or at least there
9 haven't been any studies that show --

10 MEMBER KRESS: So why not just -- if you
11 have that level of distribution detail, why not just
12 do an uncertainty?

13 MEMBER APOSTOLAKIS: Well, why not?

14 MEMBER KRESS: I mean, we know we've got
15 the 95 percentile.

16 MR. HARRISON: Well, and again, one thing
17 is the licensee will have to do an uncertainty
18 analysis as part of this, in doing the delta risk
19 calc.

20 MEMBER KRESS: Why do you need a
21 sensitivity if you have an uncertainty analysis?

22 MEMBER APOSTOLAKIS: I don't need that.

23 MR. HARRISON: Well, again, the
24 sensitivity here is used as part of -- you readjust
25 your -- you go like to your 95th percentile, or to

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1 your 5th percentile. You recalculate your RAW and
2 Fussell-Vesely's, and you see if, based on your
3 criteria, one of those moves into a different box.

4 MEMBER APOSTOLAKIS: Right.

5 MR. HARRISON: Right. That's really the
6 purpose of the sensitivity is to see if anything is
7 just barely missing the threshold, that if you tweak
8 it a little it would move across the board into the
9 other box. It's really -- that's the intent is to
10 make sure we're not either masking a result or
11 something that's sensitive to a slight change will
12 actually move.

13 MEMBER APOSTOLAKIS: Okay.

14 MR. HARRISON: So I don't want to get
15 maybe too focused on that.

16 MEMBER APOSTOLAKIS: So if the regulatory
17 guide -- I mean, say -- you said by early next year
18 Regulatory Guide 1.201 will probably be finalized. Is
19 that what you said?

20 MR. HARRISON: Sometime next year. I'm
21 not going to give you a real date, because --

22 MEMBER APOSTOLAKIS: Sometime next year.
23 Sometime next year.

24 MR. HARRISON: -- I haven't tried to --

25 MEMBER APOSTOLAKIS: Sometime next year.

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1 MR. HARRISON: -- figure out a schedule.

2 MEMBER APOSTOLAKIS: Will it include,
3 then, considerations like the ones we've been
4 discussing the last 10 minutes?

5 MR. HARRISON: Boy, that's a hard thing to
6 ask what I'm going to do, you know, six months from
7 now.

8 MEMBER APOSTOLAKIS: Well, presume --

9 MR. HARRISON: Right now, I don't see the
10 -- we wouldn't change the criteria unless something
11 came up that said there's something wrong with it, and
12 we need to adjust that. I --

13 MEMBER APOSTOLAKIS: But you will not know
14 that there is something wrong with it unless you try
15 it.

16 MR. HARRISON: Well, again, that's --
17 we've got Surry coming in. They're going to try it.
18 They're going to show us what they get from their
19 results. We'll be able to kind of work with it, and
20 then we'll kind of -- and Wolf Creek has done the --
21 their IDP recently. So we'll be able to --

22 MEMBER APOSTOLAKIS: Surry is coming in,
23 you said?

24 MR. HARRISON: Surry, yes. They're part
25 of the PRA quality pilot.

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1 MEMBER APOSTOLAKIS: Which of their 15
2 PRAs are you using?

3 (Laughter.)

4 MR. HARRISON: Well, we'll find out when
5 they submit it. You know, it's -- we're not sure.
6 But we'll have an opportunity to look and learn. And,
7 again, if we find out that the criteria needs to be
8 adjusted, we'll seek that with NEI if -- right now,
9 off the top of my head, I can't imagine it changing
10 unless, like I said, we get surprised by something.

11 MR. REED: Is it a fair statement, Donnie,
12 to say that the way we've structured this process
13 right now it's conservative in the sense that it
14 results in more SSCs staying up in boxes 1 and 2 as a
15 result of the way we structured the whole thing,
16 including what we allowed the IDP to do or not do?

17 And perhaps it's not as rigorous as some
18 might want it to be. But nonetheless, for regulatory
19 purposes, it results in a conservative answer. In
20 other words, special treatment is staying on more SSCs
21 as a result.

22 MEMBER APOSTOLAKIS: But, you see, that's
23 where I have a problem. I mean, why are we saying
24 that? How are we convinced that it is conservative?
25 I mean, there are a lot of things that are

1 conservative. I don't doubt that. But how do we know
2 that the whole process is conservative?

3 MR. HARRISON: The point here is, again --
4 I'll go back to where I started with -- is that
5 there's multiple checks that are going on. So there's
6 the check up front that -- and with the sensitivity
7 studies, to look at the -- how you are categorizing
8 into the components. That feeds into the IDP.

9 After that's done, you still do a delta
10 risk calc to make sure that there's not a greater than
11 small change. And if there is, you have to go back
12 and adjust your categorization process again. Even
13 after that, if I'm implementing and there's a problem,
14 there's -- we've now got corrective action feedback
15 loop that says, you know, either my PRAs change or
16 something has happened that makes me want to go back
17 and change things, so then I can go back there.

18 So we've tried to establish enough checks
19 and balances to assure ourselves that whatever results
20 we get will be -- we'll still be in a round that's
21 still safe. We're not going to get out of --

22 MEMBER SHACK: Let me try a slightly
23 different approach.

24 MR. HARRISON: Okay.

25 MEMBER SHACK: You know, in your external

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1 events PRA, you've been concerned that the
2 conservatisms in there will mask the importance
3 factors. You still have conservatisms in your
4 internal events PRA that are really part of this model
5 uncertainty. How are you sure that you're not masking
6 an importance factor with those conservatisms?

7 MR. HARRISON: Well, and again, part of
8 the sensitivity is to try to get at those -- at that
9 part of that question is to say, if something is
10 driving my answer high or low, let's adjust those
11 factors and see what effect it has. You know, if I
12 have a component and I do the adjustment and I don't
13 move, that's confirmation. If it does move, I need to
14 think about it.

15 And, again, that piece goes to the IDP to
16 say, you know, when I adjusted the factor, it moved.
17 You know, it went high on me when I made this change
18 in the model. And then let them actually consider all
19 of the information that you have and make a final
20 determination.

21 MEMBER APOSTOLAKIS: Yes. But the
22 sensitivity studies are based on what is already in
23 the baseline PRA --

24 MR. HARRISON: Correct.

25 MEMBER APOSTOLAKIS: -- which may be a

1 problem.

2 MR. HARRISON: Right.

3 MEMBER APOSTOLAKIS: Well, you remember
4 from the IPEs that some licensees really use the very,
5 very low numbers for human actions.

6 MR. HARRISON: Right.

7 MEMBER APOSTOLAKIS: So the peer reviewers
8 are expected to catch that?

9 MR. HARRISON: Within the internal events
10 there's a -- we've got a standard now that we're --
11 that's out for trial use. Either the peer review or
12 the self-assessment is supposed to look at the
13 standard of how they do things or what's required and
14 see if they meet that standard.

15 If they meet the standard, we then will
16 look to make sure we agree with that as part of this
17 process. And we'll move on from there. It's -- I
18 can't guarantee you that a peer reviewer is not going
19 to miss something or is not going to --

20 MEMBER APOSTOLAKIS: This seems to be a
21 recurring problem, and I'm wondering why we have to
22 talk about it all the time. Why is there such
23 reluctance to address it head on and say maybe the
24 conclusion you gave us earlier -- it doesn't matter,
25 or if this thing appears tomorrow and we handle it

1 this way, what's the problem? Why don't people --

2 MR. HARRISON: Well, I think that does
3 happen, though. I mean, my experience with license
4 submittals -- they address the peer review comments
5 exactly that way. If a peer reviewer makes the
6 comment, then they respond to it.

7 MEMBER APOSTOLAKIS: But I don't want to
8 rely on the peer reviewers. I want the agency to have
9 something -- to have some documentation that we have
10 looked into these things, and we have satisfied
11 ourselves that there is no problem. Or if there is a
12 problem, we take care of it. Why should I rely on
13 peer reviewers that -- I don't know who they are. I
14 don't know what their backgrounds are.

15 And after all, 20 years ago everybody
16 thought human error was not important. Well, that's
17 the truth. So why would I expect them now to know
18 that the French have done something that shows that
19 the numbers are higher. You know, I mean, very few
20 people know these things.

21 So I'm really surprised that there is such
22 reluctance to get into this thing, which I -- I don't
23 think it's -- it shouldn't be such a big deal.

24 MEMBER ROSEN: I don't think you're
25 characterizing it right, Donnie. The process, as I

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1 understand it -- when the licensee comes in and asks
2 for approval to categorize his components, you're
3 going to look at his PRA, and you're going to look at
4 how he has treated, for example, human error.

5 MEMBER APOSTOLAKIS: Right.

6 MEMBER ROSEN: If he's using those very
7 low numbers that we've seen used in the past, these
8 guys will pick that up right off the bat.

9 MEMBER APOSTOLAKIS: I understand that.
10 I mean, if they say it's 10^{-6} , probably that would
11 raise a flag.

12 MEMBER ROSEN: Right. And then the
13 licensee will have to correct that before -- so I
14 think it's embedded in the process.

15 MR. HARRISON: That is correct. It's not
16 like we turn a blind eye. I mean, when we do license
17 amendment reviews now, if we know a licensee has
18 traditionally used small values, we'll look at that.

19 MEMBER APOSTOLAKIS: But, you know, when
20 I read that paper by Blye and the other guys, they
21 said one -- they found that one significant model
22 uncertainty that affected CDF was the HVAC success
23 criteria. I didn't know that. I had no idea. Why
24 did that find that? Not because they're very smart;
25 because they looked. They did a few things.

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1 And I'm wondering why we can't do the same
2 thing and look at a few things and say, you know, this
3 appears to model, this appears not to model. Why
4 would the reviewers know this, unless they have read
5 the paper?

6 MEMBER ROSEN: Well, George, I think that
7 the reviewers I'm counting on are just the same ones
8 you want to count on -- the staff review. The peer
9 review is helpful, don't misunderstand, but for
10 regulatory purposes the -- all the regulators are
11 going to do is know there's going to be a peer review.

12 But they're relying a priori on their own
13 expertise and knowledge, and they will know what we do
14 in some circumstances.

15 MEMBER APOSTOLAKIS: No, because -- .

16 MEMBER ROSEN: HVAC, for instance, in the
17 auxiliary buildings -- electrical auxiliary buildings,
18 in particular -- can be very important and very --
19 very risk-significant in certain loss of power
20 scenarios. Those buildings overheat very quickly
21 because of all of the heat sources in them, and they
22 can lead to unavailability of key safety components.

23 So HVAC figures in a lot of risk-
24 significant sequences, if the PRA is done right on
25 those circumstances. So it's not a surprise to me to

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1 hear that, so I'm relying on the staff expertise. I
2 think they have it.

3 MEMBER APOSTOLAKIS: Now, remember, the
4 staff will approve the process, right?

5 MR. HARRISON: Right.

6 MEMBER APOSTOLAKIS: They will not review
7 individual --

8 MR. HARRISON: We won't look at individual
9 submittals or individual system pieces, but we will,
10 as part of our process review, look at the PRA quality
11 piece of that. So I would expect that the reviewer
12 would look at --

13 MEMBER ROSEN: Wait a minute. Wait a
14 minute. What I don't want to be hearing here is that
15 you're going to go what we used to call "procedure-
16 dumb." You know, we're going to get process-dumb in
17 the NRC. All I do is follow this procedure. I'm not
18 -- I don't have to engage my brain. All I have to do
19 is follow this -- in this case a licensing procedure.
20 No, no. We don't hire guys who know about PRA not to
21 use their PRA expertise.

22 MR. HARRISON: Right. Right. Now --

23 MEMBER ROSEN: We can hire anybody that --
24 anybody can be procedure-dumb. If we just give them
25 the procedure and say, "Follow this," that's not the

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1 point.

2 MR. HARRISON: Right.

3 MEMBER ROSEN: We want to give the people
4 who know something about the subject matter a
5 procedure to follow, just so that we can organize the
6 work. But we expect them to use their knowledge and
7 experience.

8 MR. HARRISON: Right. And the way we do
9 the review would not be if someone -- if a licensee
10 came in, said, "I'm applying this to System X, service
11 water, and that's the only system I'm going to do
12 right now, I can back and do later, here's my
13 categorization process."

14 We will review and approve the
15 categorization process. We will not just look at
16 service water with a blind eye and say, "Is the PRA
17 related to service water acceptable?" We will look at
18 the whole PRA, because we don't know where he's going
19 to apply it in the future. So --

20 MEMBER ROSEN: Are you going to look at
21 what systems come out significant-- risk-significant?

22 MR. HARRISON: What we would do is we'd
23 look at -- well, we may not know the answer to that,
24 but what we'd do is we'd know within the -- again, the
25 PRA quality review of that would be to look at, does

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1 their PRA meet the standards that are out there?

2 MEMBER ROSEN: I mean, that's the -- when
3 you say you won't know the answer, that troubles me.

4 MR. HARRISON: Well --

5 MEMBER ROSEN: It seems to me that the
6 first question you ask after you understand that they
7 did the PRA in accordance with the standard, and blah,
8 blah, blah, the peer review and all of that, they did
9 internal events and they did external events, and so
10 and so, you know, the structure, the first question
11 you ask is: what systems come out risk-significant?
12 And what are the functions that are risk-significant?

13 And if you get answers to that that are
14 generally consistent with your understanding of the
15 plant design, then you can go on to the next thing.
16 But if they come out and say, for example, that
17 service water is not risk-significant, well, you say,
18 "What? It always is risk-significant." Electric
19 power -- auxiliary -- I mean, onsite electricity is
20 not risk-significant.

21 Well, it may not be, but you need to
22 explain it. You know, some plants with very, very
23 robust offsite power networks may not have risk-
24 significance because of onsite power.

25 MR. HARRISON: Yes.

1 MEMBER ROSEN: But it would require some
2 discussion. It's not something you'd give an
3 A priority. So I'm counting on the staff to ask at
4 least those threshold questions. At least in my model
5 of what -- how this was going to work, the staff was
6 not going to go licensing procedure-dumb and just
7 follow the procedure. They're going to get
8 knowledgeable to some level of -- some degree on the
9 substance of the PRA they're looking at.

10 MR. HARRISON: No. And I agree with your
11 premise. The only point I would make is that the
12 categorization process can be selective. And when
13 they make their submittal, they don't necessarily have
14 to say, "We've already done all of the calculations to
15 tell you what we've determined is high or low." Odds
16 are if it's high, they're not even going to categorize
17 that system. They're just going to leave it, right?
18 There would be no benefit, unless they can find
19 components within the system to make low.

20 MEMBER ROSEN: Which is typically what
21 happens.

22 MR. HARRISON: And --

23 MEMBER ROSEN: If function in the system
24 is high, even though the system is high, there's lots
25 of stuff in it that isn't --

1 MR. HARRISON: Right.

2 MEMBER ROSEN: -- and that's what you're
3 trying to find.

4 MR. HARRISON: Right. Now, the first cut
5 through would be at the system level, if they can make
6 whole systems low. That would be the key. But,
7 again, we're not -- it's an approval of the
8 categorization process with a review of the PRA to
9 make sure we have confidence that it will generate the
10 results that then they can use.

11 So I'm not going to say -- we would have
12 expectations -- if something showed up low that we
13 thought would surely be high, we would have those
14 expectations. But we may not -- the licensee may not
15 tell us that, "Oh, I've gone off and made my, you
16 know, RHR system low" with their submittal, because
17 they may not have categorized RHR. So we wouldn't
18 have the information at that point.

19 MEMBER APOSTOLAKIS: Okay. Let's move on.

20 MR. HARRISON: Okay. Now, just a point,
21 that really hasn't changed since February.

22 MEMBER APOSTOLAKIS: Well, has anything
23 changed since February?

24 MR. HARRISON: A couple of things.

25 MEMBER APOSTOLAKIS: Like what?

1 MR. HARRISON: We'll get to that on the
2 next slide. One thing that is a change is more --
3 this is more of an editorial change. We moved up the
4 last bullet her from -- it was a comment in the prior
5 Rev C as a specific comment.

6 We moved it up into the general positions
7 dealing with common cause failure and degradation
8 mechanisms to point out that, really, that's a pass-
9 through through the process. It's not necessarily
10 something where they're going to adjust the risk
11 sensitivity study to address degradation mechanisms.

12 They need to maintain those systems -- or
13 maintain those programs, known degradation mechanisms,
14 so that when they do the risk sensitivity study it's
15 still valid. They don't take off a MIC program and
16 then six years from now we start finding failures due
17 to MIC. I mean, it's that type of thing. That
18 program should carry through.

19 So that -- that's the point that it's
20 trying to get at in the last bullet. So we just
21 elevated it from a specific comment into the general
22 positions.

23 The other three were from the last round.
24 You know, if you --

25 MEMBER APOSTOLAKIS: So uncertainty -- oh,

1 I'm sorry. Go ahead.

2 MR. HARRISON: Go ahead.

3 MEMBER FORD: At the last meeting -- maybe
4 this is related to the comments that came up in the
5 February meeting about degradation. In 50.69, it says
6 quite specifically you had to take into account aging
7 mechanisms.

8 MR. HARRISON: Right.

9 MEMBER FORD: And yet in the NEI 00-04
10 document it says nothing at all about guidance as to
11 how you treat them.

12 MR. HARRISON: Right.

13 MEMBER FORD: So from what you just said,
14 could you just tell me again how that --

15 MR. HARRISON: Okay.

16 MEMBER FORD: -- is covered.

17 MR. HARRISON: Right.

18 MEMBER FORD: Where is the guidance,
19 specifically?

20 MR. HARRISON: What we're dealing with
21 there is -- is in the rule, I think it's in Section B
22 on the submittal, the fourth part of that talks about
23 needing to address common cause failures and
24 degradation -- known degradation mechanisms.

25 I think you're right. When you look at

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1 NEI 00-04, there's not a discussion of that. What
2 we've done is said, as a position, you need to
3 maintain those programs that address known degradation
4 mechanisms and pass that through, so that on treatment
5 -- you've identified those programs, so that on
6 treatment you know to maintain them.

7 So that's why -- I refer to it as a pass-
8 through. They're not really going to touch those
9 programs.

10 CHAIRMAN BONACA: Let me just expand on
11 these issues, because you've been -- we've been
12 discussing right now three of the five or six
13 recommendations we had in our letter of 2002.

14 In a response to the letter, we were told
15 that these issues would be discussed and dealt with in
16 the final, you know, development of the rule. And we
17 haven't seen a discussion of these items. That's why
18 they are being resurrected here. We are all begging
19 for an answer about issues we raised two years ago,
20 and nowhere we have found resolution in the sense of
21 an answer to that.

22 So when I was preparing for this meeting
23 at home, I began to look at the public comments. You
24 know, each one of the public comments evidently was
25 deserving of an answer in writing. But we haven't

1 seen an answer in writing for the comments we asked of
2 the staff two years ago. At least -- I don't know if
3 you've seen them anywhere. And I think this is really
4 probing, again, on the same issues, and I'm puzzled.
5 I was puzzled by it.

6 MR. REED: On the last issue, I think it's
7 a matter of the way you look at it. I mean, NEI 00-04
8 and our Reg Guide are fundamentally looking at
9 categorization. The issue of common cause failure and
10 degradation is a treatment issue. Okay?

11 Now, the IDP and expert panel needs to be
12 aware of that. Okay? When you -- if you're going to
13 put something in box 3, okay, and it does have
14 degradation, basically what you're doing is you're
15 crediting something to maintain that. Okay? If it's
16 a MIC program, or whatever, you are essentially
17 crediting that program.

18 So the IDP has to pass that along and say,
19 "Look, you know, in treatment you need to basically
20 maintain this on that in order for us to maintain the
21 assumptions consistent with the categorization process
22 -- a rule requirement."

23 So that's -- I think that's what Donnie is
24 trying to say. So if you look at NEI 00-04, or if you
25 look in our Reg Guide, you're not going to see

1 treatment. It's not there. It's in the rule. Okay?
2 And RISC-3 treatment is at a high level in the rule.
3 Okay?

4 That's from the day one, basically, all
5 the way back to basically 2000 -- or 1999 even. We've
6 determined that we weren't going to get into the
7 specifics on treatment and reviewing and approving
8 that. So we've stayed at a high level.

9 We had several public comments on
10 degradation and common cause failure, and we have in
11 90-some-odd pages of responses -- I'm sure we have
12 some answers in there. I don't -- apparently not to
13 the satisfaction of this committee, but --

14 MR. HARRISON: And, again, I guess I would
15 say that the answer we'd try to give you for that from
16 the last two years -- on this particular topic is that
17 you're going to maintain that program.

18 MEMBER ROSEN: Well, with respect to
19 treatment and degradation mechanisms, I think you have
20 given a satisfactory answer. 50.69 is not set up to
21 deal with the issues that Dr. Ford and Mario properly
22 raise. I mean, the issue is, are you going to
23 maintain the plant and deal with the known degradation
24 mechanisms? But 50.69 wasn't set up to -- you know,
25 to deal with that.

1 Those are programs that are in place. The
2 only thing we want to worry about with 50.69 is that
3 somehow it doesn't -- those programs don't
4 inadvertently get taken off or somehow deemphasized.
5 And that's the issue.

6 And I think you've properly said that's
7 passed through, that -- IDP has to make sure that some
8 sort of treatment for the service water system -- it
9 might have MIC or some other form of active
10 degradation. It isn't because someone decides that a
11 piece of it goes in RISC-3. It isn't removed for that
12 component or function.

13 MEMBER FORD: So does that mean -- if
14 that's the -- you're nodding. Does that mean on the
15 IDP panel there will be a materials expert?

16 MEMBER ROSEN: No, not -- no. But
17 available for the IDP.

18 MEMBER FORD: So you could have a
19 situation -- for instance, in this example, that BWR
20 core shroud could be designated a RISC-3 component.
21 And yet if it degrades, as it does, in a plant-
22 specific manner, it need not necessarily be a RISC-3
23 component. So who is going to make that decision?

24 MR. REED: Clearly, if it degrades in the
25 performance information, however you acquire on this

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1 -- on this component, however you would do that, and
2 if it did degrade and its performance wasn't
3 consistent with the assumptions made in the
4 categorization process, then you either must increase
5 the treatment and make it consistent again and/or put
6 it back up in the box 1. Not a good situation to put
7 something in the -- back to box 1, if you're a
8 licensee, after it's been in box 3 for a while. So
9 it's something they certainly want to avoid.

10 MEMBER FORD: If I understand the rules
11 for RISC-3 is that you -- you're no longer carrying
12 Part 52, but you have the quality control release on
13 RISC-3. So you could be building this core component,
14 which is now said to be a RISC-3 category, out of what
15 we really know are inferior or not adequate materials.

16 MR. REED: Nonetheless, the component must
17 have design basis capability. It's really pretty
18 specific about that. So I think if you knowingly
19 build it out of something that clearly would not have
20 that capability, you would pretty quickly be in
21 violation of 50.69.

22 MEMBER APOSTOLAKIS: Now, in Section 7 of
23 the Regulatory Guide --

24 MR. HARRISON: Okay.

25 MEMBER APOSTOLAKIS: -- you address these

1 issues.

2 MR. HARRISON: Right.

3 MEMBER APOSTOLAKIS: And you say on
4 page 6, "The appropriate factor to use in the risk
5 sensitivity study to represent the potential reduction
6 in reliability due to the relaxation of special
7 treatment must be determined in concert with the
8 consideration of the potential for cross-system common
9 cause failures and known degradation mechanisms."

10 MR. HARRISON: Right. Now, the
11 parenthetical -- there's a parenthetical in there.

12 MEMBER APOSTOLAKIS: Yes.

13 MR. HARRISON: It says, "And retain
14 defense against."

15 MEMBER APOSTOLAKIS: Right.

16 MR. HARRISON: So the point of that
17 parenthetical it says, "If I maintained my program,
18 then I can basically say that program is addressing
19 that degradation mechanism. So my risk sensitivity
20 study doesn't need to address it directly."

21 If someone were to want to come in and
22 play with that program, or to back it off on a system,
23 he would then need to look at that and say, "If I back
24 off on that program, I'm going to have to adjust the
25 fact -- I'm going to have to make sure my risk

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1 sensitivity study accounts for that degradation
2 mechanism potential."

3 MEMBER APOSTOLAKIS: But you go on and say
4 here that the licensee has to demonstrate an
5 understanding of the effects, an understanding of the
6 programmatic activities, and c) to factor this
7 knowledge into both the treatment applied to and the
8 factors used to the RISC-3 SSCs.

9 MR. HARRISON: Right.

10 MEMBER APOSTOLAKIS: Now, the factors are
11 the sensitivity and --

12 MR. HARRISON: Sensitivity. Well, this is
13 the risk sensitivity study.

14 MEMBER APOSTOLAKIS: Is there any guidance
15 on how this should be done?

16 MR. HARRISON: Beyond this, no. What
17 we're saying is you should have -- you should have the
18 knowledge that sets up, so that you can pass this
19 information on -- on to the treatment side. But, no,
20 we're not giving specific guidance on how to do that
21 or what -- if you did -- if a licensee did say, "I'm
22 backing off on my FAC program for this component,
23 because it's low," we're not telling them how to
24 derive that factor.

25 But I can tell you if someone did choose

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1 to do that approach, we would be -- we would be
2 looking with a finer tooth, you know, microscope or
3 whatever, to take a look at that.

4 The expectation is most plants will not do
5 that.

6 MEMBER APOSTOLAKIS: I know.

7 MR. HARRISON: And will pass it through.
8 If someone does, we're going to have to look at it.

9 MEMBER APOSTOLAKIS: On Section 6, you say
10 that the NRC notes that the draft --

11 MEMBER ROSEN: What page are you on?

12 MEMBER APOSTOLAKIS: 5.

13 MEMBER ROSEN: Page 5.

14 MEMBER APOSTOLAKIS: The NEI report does
15 not address modeling or data uncertainties explicitly.
16 The applicant or licenses must address uncertainties
17 consistent with Section 2.215 of Regulatory Guide
18 1.174. Do you think they're going to do that? Has
19 anybody ever done what the Regulatory Guide says?

20 MR. HARRISON: Well, the --

21 MEMBER APOSTOLAKIS: I don't think so.

22 MR. HARRISON: The expectation here is is
23 that, yes, that will be done. And we will --

24 MEMBER APOSTOLAKIS: But you just argued
25 earlier that nobody needs to worry about model

1 uncertainty.

2 MR. HARRISON: Well, no, I -- I wasn't
3 arguing that. What I was arguing was -- was in a
4 particular case the uncertainties -- their impact was
5 insignificant for their submittal.

6 MEMBER APOSTOLAKIS: And nobody doubts
7 that.

8 MR. HARRISON: But you have to walk
9 through that rationale. Well, and again, that's -- as
10 part of this rule, they're going to need to do that.
11 And what this position is is, at least the attempt is
12 to point -- make it clear that we want a discussion of
13 the key sources of uncertainty. We want to know
14 modeling uncertainties, and we want those addressed.

15 MEMBER APOSTOLAKIS: But isn't the purpose
16 of a regulatory guide to give guidance? Just telling
17 them --

18 MR. HARRISON: Well, I think the guidance
19 in Reg Guide 225 --

20 MEMBER ROSEN: Section 225.

21 MR. HARRISON: Section 225 of Reg Guide
22 1.174 I think is clear enough for people to know what
23 they need to do. This is just saying, "Go do that.
24 As part of this application, you need to go do that."

25 MEMBER APOSTOLAKIS: Anyway, why don't we

1 go on, because we have to save some time for NEI.

2 MR. HARRISON: I'll speed up. We'll just
3 go to the specific comments. These are just the
4 categories we had. We had a number of
5 interpretations, clarifications. Many of them carry
6 over from what we had made -- these clarifying
7 comments on Reg Guide -- on Draft Guide-1121.

8 There were a couple of additional things
9 added in that were what I called regulatory or legal
10 clarifications, where the use of the phrase "important
11 to safety" was pointed out to be -- from the Legal
12 Department, it was incorrectly used. So we've
13 provided a clarification of what we -- in this context
14 what was meant by that phrase.

15 There were a number of technical
16 clarifications. Here's a few examples of those. Just
17 real quickly, when you do a seismic PRA, you can
18 screen out buildings and piping and large components
19 because of their seismic robustness. They are so
20 robust you don't even model them. That fact needs to
21 be captured by the group that comes in and does the
22 sensitivity studies on seismic PRA, to know that some
23 things are inherently robust. And so by definition,
24 they are high, because you're counting on that
25 robustness not to model them.

1 If those components get called low, then
2 you've inherently established a design criteria on
3 that component to -- it's got to have that seismic
4 robustness, because you took credit for it.

5 The other one is just there was a piece
6 that was missing in the NEI guidance where it talked
7 about peer review findings. There's also the need to
8 do a self-assessment, and so those findings have to be
9 addressed.

10 And then there was just some additional --
11 there's a list of five items that the NEI guide had on
12 IDP considerations. We suggested some tweaks to those
13 five, and then added another four as part of the IDP
14 consideration of components.

15 And then the last one is -- that's the
16 technical objection that we had. In the final draft
17 there was a discussion in a paragraph on the risk
18 sensitivity factor that's used, and we basically have
19 said that we disagree with the way that factor is
20 derived and implemented. And the point here is this
21 is really an implementation issue. It's not
22 necessarily a categorization issue. It's --

23 MEMBER APOSTOLAKIS: Can you tell us a
24 little more about this?

25 MR. HARRISON: Yes. If you -- it's in

1 Section 8, and --

2 MEMBER ROSEN: Of? Section 8 is --

3 MR. HARRISON: -- of the --

4 MEMBER ROSEN: NEI guide?

5 MR. HARRISON: -- of the Reg Guide 1.201.

6 MEMBER ROSEN: Section?

7 MR. HARRISON: The paragraph is in
8 Section 8, too, so -- but there was a paragraph in
9 there that talked about how they would look at future
10 performance of the SSCs. And if they had expected, in
11 a group of SSCs to have five failures that -- and they
12 used a factor of three in the risk sensitivity study,
13 that then this wouldn't be an issue for that group
14 until they got to 15 failures. And the staff has said
15 that that's not -- that's not an appropriate way to
16 look at how to do this.

17 And then we provided what we believe a
18 program should have, which is when I have a failure --
19 again, we're passing through this degradation
20 mechanisms and the common cause failures, if I have a
21 RISC-3 component fail, we're not saying go out and do
22 an exhaustive corrective action program on it, but
23 we're saying look at it and assure yourself that this
24 is not a common cause failure potential, or that it's
25 because I did something that's affecting my -- my

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1 performance globally.

2 Do that look, if you can assure yourself
3 it's just a random failure, you know, the lightbulb
4 blows, then fine. But if you think it's a potential
5 common cause failure, or a fact of I took treatment
6 off and now the failure is exactly because I took the
7 treatment off, I should go back to look at the rest of
8 that group and say, "Is there a problem here?" And I
9 should address it at that point. I shouldn't wait
10 until I get 15 failures before I start asking those
11 questions.

12 MEMBER APOSTOLAKIS: They didn't object to
13 the limit of 20 for RAW for common cause failures?

14 MR. HARRISON: No. We've discussed that
15 with the industry a number of times over the last two
16 years about how to deal with common cause failure and
17 the importance measures, because what happens with
18 that is you end up getting a system-level -- if I'm
19 looking at a component but I use common cause failure,
20 I'm really getting a system-level importance. I'm not
21 getting a component importance.

22 And so it was discussed back and forth how
23 to properly address the RAW value for that, and --

24 MEMBER APOSTOLAKIS: I don't understand
25 that. Why? I mean, isn't that an event like any

1 other?

2 MR. HARRISON: Gareth Parry is laughing at
3 me now. So --

4 (Laughter.)

5 You know, it's -- there's a number of ways
6 you can look at it. You could say this is a -- the
7 common cause failure modeling is a convention of
8 convenience. It's a mode of failure that a group of
9 components can have, but the way we model it in the
10 PRA is as a basic event, as if it were a different
11 component, right?

12 There are a number of different proposals
13 of how to deal with that, from ignoring it completely
14 to addressing it as just part of the component, to
15 using it -- if you use a multi-Greek letter, to use
16 the beta-gamma if it's a three-component system, and
17 let that represent the component, recalculate your
18 RAWs from that.

19 It was proposed to go this route, where if
20 I have a RAW of two, and a typical system gets you
21 about a factor of 10, then a raw of 20 would represent
22 what a common cause --

23 MEMBER APOSTOLAKIS: I didn't follow that.

24 MR. HARRISON: If I have a single train,
25 and I go to a two-train system --

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1 MEMBER APOSTOLAKIS: Yes.

2 MR. HARRISON: -- that I should gain an
3 order of magnitude reliability in that. Okay? So if
4 I'm looking at trying to figure out the component
5 level, the rationale that's behind all this, then I
6 increase my RAW value by 10 to represent the change
7 from a component level to a system level, or a train
8 level to a system level.

9 MEMBER APOSTOLAKIS: I don't understand
10 that at all. I have a PRA, and the purpose of the
11 importance measures is to tell me that if I change
12 this to always down, what happens to core damage
13 frequency? And if it's more than two, I think I just
14 look at it. But when it comes to common cause
15 failures, if I change it, and I say the thing is
16 always down, and the CDF is multiplied by 10, I say,
17 "No, I'm not going to look at it." Why not?

18 MR. HARRISON: Again, that -- part of this
19 may be as an artifact of also how we're doing this.
20 If the baseline analysis gets you a RAW that's over
21 20, it's high, and it will be high. If I do my
22 sensitivity on common cause failures, and I push it
23 over that threshold, now the IDP can look at it and
24 consider it.

25 MEMBER KRESS: I think George is saying

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1 that it seemed like you should have divided by 10
2 instead of multiplied to get the threshold for things
3 subject to common cause effect.

4 MR. HARRISON: No. You would have to do
5 it -- if you're going to do anything, you'd have to go
6 to a higher RAW value to represent it correctly.
7 Again, because if you did this on a beta-gamma, you
8 would have moved upward. You wouldn't have gone down.
9 So --

10 MEMBER KRESS: Well, let --

11 MR. HARRISON: But, again, this is the
12 convention we settled on.

13 MEMBER KRESS: I mean, you're wanting to
14 take -- you're wanting to include those things subject
15 to common cause, and they're safety-related because
16 they have a big effect. And so the threshold you
17 choose -- you say these things -- you take a bunch of
18 them out and say, "These are subject to common cause
19 failure." If the RAW for each individual one is two
20 divided by 10, then you're including a lot more of
21 them, because they have a bigger effect. It seems to
22 me like you ought to divide to get the threshold.

23 MEMBER APOSTOLAKIS: I have to think about
24 it.

25 MEMBER KRESS: Well, think about it. It

1 looks to me like --

2 MEMBER APOSTOLAKIS: Yes, but it --

3 MEMBER KRESS: I might be looking at --

4 MEMBER APOSTOLAKIS: The counter argument
5 may be that it's a flaw of RAW, because in RAW, in the
6 risk achievement worth, you take a probability and you
7 set it equal to one. And you can make an argument
8 that here, you know, it's a failure of a system. The
9 probability is very low, and now you are setting it
10 equal to one. You've lost a whole system.

11 MR. HARRISON: Right. That's essentially
12 what you do.

13 MEMBER APOSTOLAKIS: I mean, you do expect
14 an impact on the CDF. Now, how high can you tolerate?
15 And I think that's an argument that they are coming
16 from, yes. Maybe -- I don't know, it's the way it's
17 modeled as a separate event. Perhaps that's the
18 problem.

19 MR. HARRISON: That's part of the problem
20 is is because of -- the way we do the modeling creates
21 the problem. But --

22 MEMBER APOSTOLAKIS: But why 20 and not
23 19?

24 MEMBER ROSEN: Well, in fact, other --

25 MEMBER KRESS: Why two?

1 MEMBER ROSEN: The prototype for this was
2 that we used 10 for that -- that SDP, not 20.

3 MEMBER APOSTOLAKIS: Oh, 10.

4 MEMBER ROSEN: Yes.

5 MEMBER APOSTOLAKIS: Yes.

6 MEMBER ROSEN: So the answer is you can
7 use a different number. What you're trying to find
8 out: is this component going to be sensitive, create
9 a sensitivity for this common cause failure on it?

10 MEMBER APOSTOLAKIS: I think --

11 MEMBER ROSEN: And the answer, if you use
12 10 or 20, is either yes or no. And it goes to the
13 IDP. The IDP has to decide, oh, well, we could lower
14 this to RISC-3, but because of the potential, what we
15 know about the way we do work around here, etcetera,
16 the potential that this component could result in some
17 sort of common cause failure is high enough in our
18 view that we're not going to move this to RISC-3.

19 MEMBER APOSTOLAKIS: I think the root
20 cause for all of these discussions is that we were
21 never presented with some study, some analysis. Like
22 what Steve just said -- they used 10. They did
23 certain things and convinced themselves that it's a
24 reasonable number.

25 We always have to take what you guys are

1 saying on faith, that this is important, this is not
2 important. What we're doing is conservative, and we
3 have to say, "Yes, you are." Why is it so difficult?

4 You know, for two years now, to come back
5 here and say, "We did these studies. We took a number
6 of 9, 12, 13, 20, and here are the results. Here are
7 our reasons 20 is a good number." We've never seen
8 that.

9 MEMBER KRESS: Except you have to do that
10 for a number of plants, because it's going to be
11 plant-specific.

12 MEMBER APOSTOLAKIS: Yes. So, you know,
13 that would be part of --

14 MEMBER KRESS: It's not a trivial job.
15 It's --

16 MEMBER APOSTOLAKIS: Yes. And the other
17 thing about model uncertainty, the other thing about
18 the sensitivity studies, we were never presented with
19 anything like that that is convincing, that, yes, what
20 we're doing is okay.

21 MEMBER ROSEN: That's a Research effort.
22 And I think as Tom points out, it's plant-specific,
23 it's maybe system-specific, and may be common cause-
24 specific.

25 MEMBER APOSTOLAKIS: What do I do now that

1 I have none of these analyses? You see, that's the
2 thing. I mean, it's a little involved to do the
3 analysis perhaps when you have to think about these
4 things. But that's much better than having to take it
5 on faith now.

6 MEMBER POWERS: George, do we have
7 anything coming out of NUREG-1150 that would give us
8 -- I mean, what you're looking for is not whether it's
9 19.1 or 20.678. But, rather, is it generally in the
10 region around 20? Is it generally in the region
11 around 10, or what? And do we have that kind of
12 information coming out of NUREG-1150?

13 MEMBER APOSTOLAKIS: I don't know.

14 MEMBER POWERS: What I'm pretty sure is
15 that it would not be an enormous chore to get that out
16 of 1150. It's all there.

17 MEMBER APOSTOLAKIS: Everything is there,
18 yes.

19 MEMBER POWERS: The software is all set up
20 to do that sort of thing.

21 MEMBER APOSTOLAKIS: We have all of the
22 PRAs now. I mean, it --

23 MR. HARRISON: What I would offer on that
24 is on some of these points, again, I think you're
25 making an argument, again, for why it would be good to

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1 put this Reg Guide out for trial use. It would be an
2 opportunity to go out, especially like on the Surry
3 pilot, and ask, "How many things showed up in your CCF
4 that's greater than two but less than 20? How many
5 things showed up in that range? And how many things
6 showed up at, you know, 1.9 or just barely below that
7 range?" It would give us an opportunity to actually
8 do that.

9 MEMBER APOSTOLAKIS: Well, I don't know.
10 I mean --

11 MR. HARRISON: At least you'd have one --
12 one study that did that. But --

13 MEMBER APOSTOLAKIS: So you have 10
14 minutes.

15 MR. HARRISON: Okay. We'll jump real
16 quickly then to IDP considerations, and then we'll
17 maybe skip the trial use piece, or we'll talk about it
18 briefly.

19 I just put this slide up because I know
20 this was a topic that came up at the last February
21 meeting. And I just want to say that, in just looking
22 at this, the rule requires that the IDP be staffed
23 with expert plant-knowledgeable members. That's all
24 it says. It doesn't give you any specific knowledge
25 beyond that.

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1 The NEI 00-04, Section 9.1, provides
2 additional information. Some of this, again, I would
3 expect during the review of the categorization process
4 that the staff would review this material and make
5 sure it's agreeable to us, that this forms the expert
6 panel.

7 The licensees are supposed to establish
8 specific requirements to ensure and maintain adequate
9 expertise. The key areas of expertise that's emphasis
10 is the specific plant and experience with the plant-
11 specific risk information, and also they are supposed
12 to have described an informal plant procedure,
13 including training and qualifications of the members.

14 So with that, the last bullet just points
15 out that after the meeting last February I was aware
16 that the ASME/ANS standards development organizations
17 got together, and this was one of the things that came
18 up in that meeting. I know they're forming an
19 oversight or a management group to look over the
20 standards development. This might be something that
21 they consider in the future. Is there a need for IDP
22 guidance -- standardized guidance?

23 So I'll just put that out there.

24 We'll go to trial use real quick. This
25 was our rationale for trial use. There remains the

1 one technical issue on the use of the risk sensitivity
2 study, the factor in there. There is also some
3 supporting documents that the NRC and the industry
4 haven't come to closure on, and I just throw up an
5 example. Here is the N-660 guidance still in process.

6 We don't expect any major changes through
7 the trial period, but we definitely are going to learn
8 some things. And, again, if we get surprised by
9 something, we'd have the opportunity to --

10 MEMBER APOSTOLAKIS: How many pilots will
11 you have?

12 MR. HARRISON: We have not actually
13 established formal pilots. We refer to pilots -- it's
14 really -- like Surry is already in process doing this,
15 and they're part of the PRA quality pilot. So we
16 would -- if you will, we're trying to piggyback on top
17 of that to learn lessons here.

18 And Wolf Creek is also doing work. Right
19 now, they -- like I said, they just finished their IDP
20 a month ago or something like that.

21 MR. REED: Yes. Westinghouse Owners Group
22 is supporting both Surry and Wolf Creek. And what I
23 referred to in this package as a submittal pilot for
24 50.69 purposes, where they provide a submittal, we'll
25 look at it. You know, this is sort of -- pretend this

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1 is how it's going to work. They have provided a
2 submittal review and approve it kind of thing.

3 And, of course, in doing that we would
4 have to address some of these key issues that have
5 been bouncing around the committee this morning. And
6 we hope in the resolution of that we'll close some of
7 these holes in the Reg Guide.

8 MEMBER APOSTOLAKIS: The first bullet,
9 "Remains number one technical issue," what is it that
10 remains number one?

11 MR. HARRISON: Oh. Remains one technical
12 issue -- that's just my shorthand. That's the issue
13 that the staff had on the risk sensitivity factor
14 that --

15 MEMBER APOSTOLAKIS: Oh. You mean there
16 is one technical issue that remains.

17 MR. HARRISON: Right. Thank you.

18 MEMBER APOSTOLAKIS: Okay.

19 MR. HARRISON: One of these days I'll
20 learn English.

21 MEMBER SHACK: That's great, George. He
22 just puts it backwards.

23 MEMBER APOSTOLAKIS: We figured it out,
24 didn't we?

25 MR. HARRISON: Shorthand. Okay.

1 And just in summary, again, there's the
2 one technical issue we have, and we're working with
3 NEI on it. We're going to continue to work with NEI
4 as they develop additional final versions of NEI 00-
5 04, so that hopefully we can endorse it, and the
6 issues that we've raised here will go away. And we'll
7 continue to work with staff through the early
8 implementation of --

9 MEMBER APOSTOLAKIS: Let me ask you a
10 couple of questions. With respect to treatment, Tim
11 told us earlier that the rule itself is -- gives high-
12 level guidance. Do you expect in the future to have
13 some regulatory guide or something -- guidance
14 document or you will approve them on a case-by-case
15 basis or --

16 MR. REED: We're not reviewing and
17 approving RISC-3 treatment, and at this point in time
18 we do not expect to have any regulatory guidance on
19 RISC-3 treatment.

20 MEMBER APOSTOLAKIS: So the licensee will
21 decide what to do.

22 MR. REED: Yes. If we get into that, it
23 would be through inspection. And even there, our
24 inspection program would tend to look at the safety
25 significant aspects of the 50.69 program, and would

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1 tend not to look into the RISC-3 treatment, except for
2 common cause and those kinds of things, which can make
3 RISC-3 become --

4 MEMBER APOSTOLAKIS: Okay.

5 MR. REED: -- significant.

6 MEMBER APOSTOLAKIS: And the request for
7 a letter today, do the rule and the Regulatory Guide
8 go together? Or do we have to make separate
9 recommendations? Or is it up to us? Well, what are
10 you requesting? You are requesting approval of both,
11 right?

12 MR. REED: I'll leave it to my management.

13 MR. MATTHEWS: Given that we've written
14 the regulatory -- this is David Matthews, Director of
15 Regulatory Improvement Programs. Given that we've
16 written the Reg Guide as if we were going to endorse
17 with conditions, we would like your endorsement of
18 that -- that combined package, which is the rule --
19 the Reg Guide endorsing 00-04 with conditions, and I
20 want you to look at our conditions -- okay -- with the
21 expectation that we would hopefully end up with a
22 final NEI document that would absorb those conditions
23 and agree with them, such that we could issue a Reg
24 Guide later that would be a blanket endorsement.

25 But either way your view would be that the

1 staff's position with regard to NEI 00-04 is the
2 appropriate position. Okay? And we would like a
3 letter that would endorse both that position and the
4 rule.

5 MEMBER APOSTOLAKIS: Okay. Any questions
6 for the staff before we move on?

7 MEMBER SHACK: Just one. The risk
8 sensitivity always keeps coming up. The one I'm
9 concerned -- you know, you -- when they're sort of
10 doing the final delta CDF to assure that the overall
11 risk is small, we have the two to five factor. And
12 then there's the statement that, you know, you have to
13 really pick the factors, so that you can detect it.

14 And, you know, since we're looking at
15 reliability under design basis events that we don't
16 expect to happen very often, has anybody actually
17 looked at the practical implications of, you know --
18 does that really mean reliability under the design
19 basis events, or sort of the nominal reliability that
20 are -- that's in this thing in the first place?

21 Is it a practical thing to do, what's
22 being asked?

23 MR. HARRISON: Yes. The way to interpret
24 that is it's the nominal. We're not saying go off and
25 do a design basis, you know --

1 MEMBER SHACK: So we're looking at the
2 wrong reliability.

3 MR. HARRISON: Well, it's the only
4 reliability information you're going to get. It's not
5 necessarily the wrong reliability. It's the
6 information that's available, that you can do, because
7 when --

8 MEMBER SHACK: Well, it's like saying,
9 okay, I'm going to solve the problem I can, even if
10 it's not the right one.

11 MR. HARRISON: But, again, remember Tim's
12 piece about you still have to make sure you have
13 design basis functionality. So it's got to be
14 designed to work under those conditions. When we go
15 out and we test a component, we don't test it
16 necessarily under full design basis conditions -- or
17 we can't do that test. So we test it, and we get the
18 information we can get from that, and we use that
19 information. It may be a practicality point on that
20 is --

21 MR. MATTHEWS: On occasion, it's
22 inferential information --

23 MR. REED: I mean, that has certainly been
24 an issue --

25 MR. MATTHEWS: -- with what we have.

1 MR. REED: That has always been an issue,
2 trying to understand what the reliability of these
3 components are under true design basis conditions. I
4 think there's a pretty significant level of
5 uncertainty involved there. That would continue and
6 probably increase for RISC-3, and I think that's part
7 of the -- part of this framework.

8 MR. HARRISON: That's a current issue.

9 MR. REED: And we can deal with that
10 uncertainty increase, but I can't solve it. I guess
11 that's not a good answer, but that's the truth.

12 MEMBER APOSTOLAKIS: Any other comments?
13 Questions?

14 Well, gentlemen, thank you very much.

15 Now we will give the floor to Mr.
16 Pietrangelo of NEI.

17 MR. PIETRANGELO: Good morning. I didn't
18 think we'd have a lot to say this morning. The slides
19 on the rule package certainly weren't chock full of
20 information. Based on the discussion, I think I can
21 fill up my time here this morning.

22 Let me start with a Part 52 discussion.
23 All right? I'm not an expert on Part 52. I haven't
24 worked on it directly. Obviously, that's a design
25 certification rule for advanced plants. 50.69 is not

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1 a design rule. It is a treatment rule. So right off
2 the bat I have a problem seeing any relevance
3 whatsoever.

4 Second, there has been no prior discussion
5 with us certainly on this aspect of the rule. It's
6 been in the proposed rules. We didn't have any
7 comment on it before. So it's a little bit
8 disconcerting that this is coming up now at this late
9 stage of the game.

10 50.69 was viewed as a means for future
11 plants to potentially reduce costs associated with a
12 new plant, so it's important. This isn't a trivial
13 matter. And to put that on the licensee after the COL
14 -- after the design certification is done I'm not sure
15 accomplishes that purpose very well.

16 So, again, I don't know the exact language
17 that's in Part 52. I know 50.69 doesn't change any
18 design requirement, so I'd ask you to look at that
19 again. It be an issue that the staff needs to tee up
20 for the Commission. Obviously, we haven't seen the
21 thing and haven't had any discussions with them on
22 this, nor have our people working on Part 52.

23 So I'm just a little bit concerned that,
24 a) it's coming up now, and b) what the potential
25 implications are for future plants.

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1 MEMBER APOSTOLAKIS: So you disagree with
2 what the Staff --

3 MR. PIETRANGELO: This is the first time
4 we've heard the concern.

5 MEMBER APOSTOLAKIS: So you don't know.
6 You don't know whether it --

7 MR. PIETRANGELO: Because it's 50.69
8 doesn't do anything with the design. I have a hard
9 time seeing the connection there. I mean, you're
10 going to still have safety-related and non-safety
11 related SSEs for a Part 52 design certification.
12 50.69 does not change. They're still either safety-
13 related or not safety-related. They're either just
14 RISC One or RISC Three, and that only applies to
15 treatment requirements. I have a hard time seeing how
16 anything we do in 50.69 would undo anything in Part
17 52.

18 MEMBER APOSTOLAKIS: That was my question
19 to, the money. But I guess your position is that we
20 shouldn't even talk about 52 and 50.69 in the same
21 meeting.

22 MR. PIETRANGELO: Well, I'm just saying i
23 don't see the connection. This has just come up now.

24 MEMBER APOSTOLAKIS: I understand.

25 MR. PIETRANGELO: We haven't had any

1 discussion with the staff.

2 MEMBER ROSEN: You're saying that it is
3 always in your view the option of the people who are
4 proposing the plant, be it just a vendor or the vendor
5 applicant combination to go right through into 50.69
6 as part of the submittal.

7 MR. PIETRANGELO: I'm worried about the
8 potential benefit here with procurement costs for some
9 of the SSCs.

10 MEMBER ROSEN: Sure.

11 MR. PIETRANGELO: Again, I'm not exactly
12 sure how the process works, but if you wait to do it
13 after the design certification, I think all the
14 equipment might already be procured.

15 MEMBER ROSEN: Yes. Well, that was my
16 point. Tony, do you remember when I mentioned during
17 this meeting that the vendor, NSSS vendor could be
18 doing this analysis in parallel.

19 MR. PIETRANGELO: That's correct.

20 MEMBER ROSEN: And this PC submits and
21 this PC he almost submits, but doesn't. He holds it
22 back. He gets his design certified. He gets a site
23 pick with his client, and at that point, because the
24 client knows what this content of the 50.69 analysis
25 is, which is a dramatic reduction in treatment let's

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1 say for a lot of stuff. He's done his costing based
2 on that, perhaps, all those things that are important
3 for the decision to buy the plant in the first place.
4 And as soon as the site is picked and you get an early
5 site permit and all the other things, he submits the
6 analysis.

7 Now the likelihood that the staff will
8 suddenly say, well, you can't do 50.69. The point is
9 it's in the rule and he's allowed to, so I'm not
10 exactly sure -- I understand your concern but I'm not
11 exactly sure it would play out to be a problem.

12 MR. PIETRANGELO: I don't know either.
13 It's just coming up real late in the game, and we
14 haven't had any discussion on it, so I'm just trying
15 to raise it --

16 CHAIRMAN BONACA: It's something that you
17 want to procurement. I mean, you want to make sure
18 the procurement --

19 MR. PIETRANGELO: If that part is taken
20 care of, then I wouldn't have any --

21 MEMBER ROSEN: Well, the procurement is
22 typically -- the kind of procurement you're making is
23 for early components with the major NSSS components,
24 maybe the turbine generator. Those things you're
25 going to know where they're going to end up. It's all

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1 the other stuff that --

2 MR. PIETRANGELO: I just don't know.

3 That's all, I don't know. And again --

4 CHAIRMAN BONACA: You may be right. The

5 NSSS --

6 MR. PIETRANGELO: Yes.

7 CHAIRMAN BONACA: That's one way, but I

8 can understand.

9 MR. PIETRANGELO: Yes. The other point I

10 wanted to make here is that I don't we want this issue

11 to hold up this rule making either. All right.

12 MEMBER ROSEN: Will it?

13 MR. PIETRANGELO: Well, I'd rather see if

14 there's a change necessary do it in Part 52 space.

15 Don't do it in 50.69 space. That's my parochial

16 perspective.

17 MEMBER ROSEN: In other words, what you

18 are suggesting, somebody would come in grab Part 52

19 that says --

20 MR. PIETRANGELO: Well, again I'm not --

21 MEMBER ROSEN: You can do 50.69.

22 MR. PIETRANGELO: I'm not an expert on all

23 the change control mechanisms in Part 52, but it seems

24 to me for something that's not related to design, it

25 shouldn't be that hard to do.

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1 MEMBER KRESS: Well, it is related to the
2 design, because it's part of the design basis. This
3 is safety-related --

4 MR. PIETRANGELO: That doesn't change, Dr.
5 Kress. It doesn't change. It's only treatment.

6 MEMBER KRESS: It could be you're right.

7 MR. PIETRANGELO: Okay. We haven't seen
8 the rule language. And even the presentation in
9 February wasn't very explicit on changes from the
10 proposed rule and the final rule based on comments
11 received from stakeholders. To try to comment on that
12 now, not knowing what's in there, is dangerous for me
13 to do. Nevertheless, I'm going to presume that I know
14 what's in there to some extent.

15 Let me go back a step first. We had a lot
16 of discussion this morning on this thing already, and
17 what 50.69 does. Let me try to simplify it. If we go
18 through a very rigorous process to demonstrate that
19 SSCs are properly categorized. It doesn't change the
20 safety-related, non-related classification. It just
21 gives them a high or low safety significance. And we
22 spent the better part of the last five years making
23 sure that that process is very rigorous every step of
24 the way. The risk sensitivity study at the end is
25 really an adjunct to the categorization process. It's

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1 designed to demonstrate the rigor of that process.

2 We also use it later on in terms of our
3 monitoring of the SSCs that are categorized as low,
4 and I'll come back to that point in a second.

5 The rule exempts you from certain special
6 treatment requirements, the ten listed in whatever
7 section it is in 50.69. I don't remember the
8 particular section. It should be very clear. If the
9 SSC is categorized as low after you get through that
10 process, and it's like running the gauntlet. It's not
11 easy to get through that process and still be low at
12 the end of the day. Okay. But if you get there,
13 those special treatment requirements you're now
14 exempted from.

15 In lieu of those, there are four high
16 level treatment requirements in the rule, basically
17 aimed at maintaining the design-basis functionality of
18 those SSCs.

19 What muddies the water on this, and which
20 remains I think a significant issue towards long-term
21 success of 50.69 is when you start trying to back away
22 from what's in those 10 special treatment requirements
23 and tie them up with other things. And that's what
24 this known degradation mechanism business is about.
25 It's okay to exempt them from the special treatment

1 requirements, except if that treatment was dealing
2 with some known degradation mechanism. Now you've got
3 a caveat on those 10.

4 To the extent that one of the special
5 treatment, or one of the high level treatment
6 requirements in the rule even includes language from
7 one of the special treatment requirements that you
8 were exempted from. And I'm speaking to EQ 50.49, and
9 the design control high level treatment requirement.
10 Again, I'm presuming what's in there, but the same
11 language that's in 50.49 is in the high level
12 treatment requirement.

13 Most of you have been in our business for
14 a long time. When you see language that's been there
15 for years, and years, and years you know what it
16 means, hopefully, through implementation. If you use
17 the same language from the requirement that you're
18 exempted from, what does that tell the implementer. You
19 want him to do something different? You're supposed
20 to do something different to these SSCs if they're
21 low. If you use the same language from the rule that
22 you were exempted from, what are you telling the
23 implementer? What are you conveying to that
24 implementer?

25 We've commented on this probably four

1 different times to the staff, and this is a shell
2 game. You have the rule exempted, and then you see
3 the same language back in the treatment requirement,
4 so I'd urge you to look at that very closely. I'm
5 assuming you have the 400 pages that have the final
6 ruling, so I'm, again, at a disadvantage here. I'd
7 ask you to look at the closely, and whether that's
8 really the right thing to do in terms of this.

9 It's very difficult to try to do treatment
10 at the same time you're doing categorization. There's
11 a lot of things we don't know how to model in the PRA.
12 Okay. Specifically, a lot of these quality things.
13 We don't know what factor to assume if we change the
14 treatment. There is no research on that. Okay. So
15 we keep doing these bounding things all along the way.

16 All right. The issue the staff has is not
17 with the factor and how it's established. It's how
18 you monitor against that factor. That's the remaining
19 technical issue. They've sent us their latest letter.
20 It has what they want us to do to address this. All
21 right. We still need to have more discussion on this.
22 But based on a single failure, on a low safety-
23 significant SSC, the rule is going to require a
24 corrective action, as well as there's language in
25 there that we commented on to pick up the significant

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1 condition adverse to quality, which really means do an
2 extent of condition evaluation on the failure. We're
3 required to do that anyway. Everybody knows what that
4 means, but what they sent us back and prescribed what
5 you should do if you find one of those things,
6 immediately change treatment, immediately go test
7 everything else on a low safety-significant SSC on one
8 failure. We're not going to do that.

9 I think that's an overreaction to the
10 failure of a low SSC. We still have to meet the
11 requirements in the rule, do the corrective action,
12 and look at extent of condition. That's what we're
13 required to do. That's the same language, basically,
14 that's used in Appendix B.

15 MEMBER APOSTOLAKIS: Doesn't the
16 maintenance rule still apply?

17 MR. PIETRANGELO: No. That's one of the
18 treatment requirements that's exempted from these
19 RISC-3 SSCs. What we've proposed, and again, we want
20 to have more dialogue with the staff to make sure we
21 do this right, is to look at the number of failures
22 that occur on RISC-3 SSCs to see whether it's in line
23 with these presumptions we made in the risk
24 sensitivity study about the increase in failure rate.
25 It doesn't obviate us from doing the corrective action

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1 and the extent of condition on any single failure of
2 a RISC-3 SSC.

3 MEMBER APOSTOLAKIS: Do we have a copy of
4 that letter, Mike?

5 MR. PIETRANGELO: The staff letter?

6 MEMBER APOSTOLAKIS: Is that the private
7 thing?

8 MR. PIETRANGELO: No, it can't be.

9 MS. MCKENNA: This is Eileen McKenna from
10 the staff. The letter that was sent to them in
11 essence captures the issues in the Reg Guide, so it's
12 the same information that you saw in the Reg Guide.

13 MEMBER APOSTOLAKIS: I'd like to see it
14 anyway.

15 MS. MCKENNA: We can do that.

16 MR. PIETRANGELO: I'm not trying to say
17 that known degradation mechanisms are not important.
18 They are, but that's something for the treatment
19 people to look at. We're experienced with that
20 equipment. They know what those mechanisms are, and
21 they know what treatment applies to them, and they'll
22 make the appropriate decision.

23 This is a performance-based monitoring
24 approach for these RISC-3 SSCs. We'll look at the
25 performance as we go forward, but to prescribe how to

1 do that that in a way undercuts the exemption from the
2 special treatment requirements muddies the water on
3 this, and presents regulatory risk for licensees in
4 implementing this. That's the concern, and I think
5 hopefully when the rule is finally issued we have
6 clarity on this, because that's something that could
7 really undermine the long-term success and hopefully
8 broad implementation of the rule by the industry.

9 Okay. Trial use on the Reg Guide. I've
10 been calling people here for the past week trying to
11 get them to change this trial use. Obviously, I
12 wasn't successful. Let me try to make the case here.
13 We don't think this Reg Guide should be issued for
14 trial use.

15 We've been working on this thing again for
16 five years. We had four pilot applications of the
17 categorization guidance, as well as an exemption
18 request from a licensee that's now implementing this,
19 so we've had five trial uses already over the past
20 several years.

21 And let me distinguish this from what
22 we're doing on Reg Guide 1.200, the PRA technical
23 adequacy Reg Guide. The reason that was done as trial
24 use was because we had a process in place, Reg Guide
25 1.174. This was the first standard endorsed, and this

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1 committee is well-familiar with all the discussion
2 that went into PRA technical adequacy. In fact, you
3 had some more of it this morning. We didn't want the
4 amendment request, the application and review process
5 to apply to every automatically when that Reg Guide
6 came out. We wanted to put it in a limited scope
7 pilot program for trial use, because the standard had
8 never been applied in any kind of trial form. Okay.
9 So the trial use was to limit it to the pilot program.
10 That's why it was trial use.

11 In this case the opposite is true. We
12 don't want to limit the application of a final rule
13 that's taken six years to develop. We want broad
14 application of it in the industry. When you say it's
15 for trial use that means well, we expect it's probably
16 going to change. We've got to incorporate all these
17 Lessons Learned-type things. In fact, in the staff
18 slides they said they don't expect to make any changes
19 in it.

20 MEMBER ROSEN: I think they said they
21 expected the differences to narrow.

22 MR. PIETRANGELO: Well, even the two
23 plants, Surry and Wolf Creek, are not piloting the
24 categorization process. Surry is piloting this for
25 the PRA technical adequacy for Reg Guide 1.200. And

1 Wolf Creek is really more aimed at developing a
2 submittal template to help the review process along,
3 not change anything in the categorization process.

4 Now we're committed, if there's something
5 that comes up in implementation that requires a change
6 to the guidance, then it's our guidance that's being
7 endorsed. We'll have to step on that. I mean, if
8 it's causing an issue, it's in our interest to change
9 it to make it better, to make it work. We don't even
10 necessarily need to revise any NEI 00-04 to develop a
11 submittal template. We can do that on the side. But
12 saying this Reg Guide is for trial use sends the wrong
13 message out.

14 We don't want this to be of limited
15 application. In fact, the success of 50.69 hinges on
16 broad implementation by the industry, so anything that
17 conveys or connotes regulatory risk or change, or
18 instability, I think undermines the potential broad
19 application of this. So I'd ask you to look at that
20 very closely when you're writing your letter here.

21 Again, we think of the 12-page comment
22 letter we got from the staff on the Reg Guide, all but
23 two issues I think we can take care of right away. In
24 fact, we'll probably send back this Friday a final
25 draft Rev. 1. And most of those comments will be

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1 addressed. There's the two, this monitoring and
2 implementation. And there's another issue related to
3 commitment management. All right. Those are the
4 remaining two issues on the Reg Guide. And hopefully,
5 once we see the final rule language if the Commission
6 releases the SECY, we'll meet with the Staff in July.
7 There's still time to get, I think -- our objective is
8 to get a clean regulatory endorsement of NEI 00-04.

9 I think that's all I have to say on this.

10 MEMBER APOSTOLAKIS: Okay.

11 MR. PIETRANGELO: But again, we're looking
12 for clarity and regulatory stability going forward
13 with implementation of this rule. And some of these
14 issues are longstanding, that deal with treatment of
15 RISC-3 SSCs. If the thing is low, we should be able
16 to use a performance-based monitoring approach, and we
17 have to meet the high level requirements. Any more
18 specificity beyond that cut into, I think, the scope
19 of 50.69 in terms of the rules that we're exempted
20 from.

21 CHAIRMAN BONACA: Well, let me just say
22 that at least personally, one of the reasons why we
23 wrote the recommendation in 2002 that additional
24 criteria, or what we called risk metrics to include,
25 for example, inadvertent releases should be used is,

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1 in fact, the act that to eliminate RISC-3. In fact,
2 we said that, because until you have certain
3 components in RISC-3, if you're saying are not very
4 significant for PRA, but they're still controlling
5 certain paths to releases or late containment failure.

6 MR. PIETRANGELO: Right.

7 CHAIRMAN BONACA: Somebody is going to
8 feel that they're sacred enough to put some additional
9 requirements on RISC-3 components in general to
10 capture those. And that's why we said maybe you
11 should consider using some additional criteria to
12 screen out those components there, and say those go to
13 RISC-1, and all the rest goes to RISC-4, and there is
14 no more RISC-3. That's the reason why we put it in.
15 I mean, we discussed this and that was the intent of
16 that, because we felt that by the time you get to this
17 point, you're going to have no requirements, but
18 you're going to have some requirements, and then this
19 issue becomes how many requirements and what kind of
20 requirements, and so on. Here we are doing this now.
21 Right now we are too far along, and I'm not proposing
22 that we go back on that. In fact, I don't think it's
23 an issue of safety significance enough for me to
24 pursue it any further.

25 However, I think there is lack of clarity

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1 there, between the criteria that were used to design
2 the plant, and the criteria that we're using to
3 exclude or reduce the treatment creates sufficient
4 confusion there that you're going to have this
5 problem. And you're going to have still requirements
6 being imposed on RISC-3, and for some components would
7 be irrelevant. For some component, I understand why
8 they would be imposed but just as a general
9 application to all components in RISC-3.

10 MR. PIETRANGELO: Yes. I think some of
11 the items you mentioned hopefully are picked up in the
12 IDP consideration.

13 CHAIRMAN BONACA: I would expect that they
14 would be.

15 MR. PIETRANGELO: That's where those
16 should be dealt with, those kind of things.

17 CHAIRMAN BONACA: Yes, but I think until
18 you have that kind of -- you know, that's what we've
19 said all the time. We discussed that, until you have
20 this big lump of RISC-3 and you have a lot of animals
21 inside there. Some of them, they're in tech specs.
22 Some of them we have viewed as operators as sacred for
23 tens of years.

24 MR. PIETRANGELO: Right.

25 CHAIRMAN BONACA: Not any more, because of

1 allegedly core damage. And so the result of that is
2 that you are going to struggle with additional
3 requirements.

4 MR. PIETRANGELO: Well, at least in terms
5 of 50.69, it shouldn't be those 10 special treatment
6 requirements. Now you've got these four high-level
7 treatment requirements.

8 CHAIRMAN BONACA: I understand.

9 MR. PIETRANGELO: There's some overlay.
10 I think you've captured it perfectly. There's this
11 lack of clarity. You know, I understand the concern
12 about known degradation mechanisms, but I don't think
13 the way to address that is to go into using the same
14 language from the special treatment requirement in the
15 high-level treatment. That's the wrong way to do it,
16 and I think that, again, this is a performance
17 monitoring approach to the treatment of these SSCs.

18 I think licensees are smart enough to know
19 how to deal with this when they do revise the
20 treatment. South Texas has been doing it for a couple
21 of years now. The staff had them in this spring to
22 talk about how they're doing it. I think they've had
23 their resident out there and the region has gone out
24 to visit them. I understand the new EDO is going to
25 go out to South Texas very soon to look at how they're

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1 implementing 50.69. I think that's a wonderful idea,
2 but there's still inspection. But trying to bring all
3 that stuff back into treatment and back into the rule
4 just -- that's where that confusion and lack of
5 clarity comes in.

6 CHAIRMAN BONACA: That's exactly -- we
7 called it 1 and 2. And 2 was if you do this maybe
8 you'll be able to eliminate the requirements all
9 together, eliminate RISC-3 because you have a
10 population moving into RISC-4. And maybe a number of
11 them would go to RISC-4. And then you have some
12 clarity, but now you're going to have to deal with
13 that. Now you have this hodge-podge of components.

14 MEMBER APOSTOLAKIS: Any other comments
15 from the members?

16 MEMBER ROSEN: Well, only that it's kind
17 of summary in looking at your major points, Tony. I
18 think they're very well thought out. Appreciate them,
19 and they're important, but I just don't think they're
20 the major stumbling blocks. I mean, I think we can
21 work through this. I mean, I hope that --

22 MR. PIETRANGELO: It's hard not seeing the
23 final ruling. I have kind of one hand tied behind my
24 back here.

25 MEMBER ROSEN: Some of them are

1 legalistic, the linkage between --

2 MEMBER APOSTOLAKIS: Oh, you haven't seen
3 it.

4 MEMBER ROSEN: No. No one has seen it but
5 you and the -- the Commission hasn't even seen it.

6 MEMBER ROSEN: Let me just make a couple
7 of more points here. The linkage between Part 52 and
8 50.69 is a legalistic issue. I mean, it's not at the
9 heart of the substance of what we're doing. I mean,
10 it's important but it's not a PRA.

11 MR. PIETRANGELO: I think some dialogue
12 would be nice with people in the know on that. That's
13 all.

14 MEMBER ROSEN: I'm just trying to
15 characterize it. The trial use issue is another one
16 like that. The way we do this is -- it would be
17 better, I guess I agree with you, that sends a wrong
18 message, but --

19 MR. PIETRANGELO: Is there any final -- is
20 there a precedent -- I'll ask the staff, is there a
21 precedent for a final rule that has a Reg Guide out
22 for trial use?

23 MS. MCKENNA: I don't know. We'd have
24 to --

25 MR. PIETRANGELO: I'm not aware of one.

1 MEMBER ROSEN: So at least those two
2 issues. I think you raised four major issues, four
3 issues, and I think those two can be dealt within the
4 process the way this agency does business.

5 MR. PIETRANGELO: Yes.

6 MEMBER ROSEN: The other two we'll have to
7 be a little more careful.

8 MR. PIETRANGELO: And we're still going to
9 have more dialogue with the staff on them.

10 MEMBER ROSEN: And I think those can be
11 resolved by the time --

12 MEMBER APOSTOLAKIS: Anything else? The
13 staff, public. Back to you, Mr. Chairman.

14 CHAIRMAN BONACA: Thank you. Appreciate
15 that presentation. We'll take a break now until
16 10:45.

17 MEMBER APOSTOLAKIS: Very good.

18 (Whereupon, the proceedings in the above-
19 entitled matter went off the record at 10:22:50 a.m.
20 and went back on the record at 10:43:57 a.m.)

21 CHAIRMAN BONACA: All right. I think
22 we're set here. Okay. Let's get back into session,
23 and the next item on the agenda is the revised license
24 renewal review process. I understand that there will
25 be two issues addressed; one is the process by which

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1 the staff is going to review the license renewal
2 applications, and also however you address the changes
3 to the guidance documents. So with that, I will turn
4 to PT Kuo.

5 DR. KUO: Thank you, Dr. Bonaca, and good
6 morning. For the record, my name is PT Kuo, Program
7 Director for the License Renewal and Environmental
8 Impacts Program. To my right is Mr. Frank Gillespie,
9 the Deputy Director of the Division of Regulatory
10 Improvement Programs. And to my far right is Mr.
11 Steve West, the second Chief in the License Renewal
12 Program. He is responsible for the audit process
13 review and updating the guidance documents.

14 If you will recall, about several months
15 ago we informed the Committee that we were
16 implementing a new audit review process, and we --
17 that the purpose of it is to replace the traditional
18 in-house technical staff review with this audit review
19 process. And this process will look at those portions
20 of the applications that are consistent with GALL, and
21 previously staff positions.

22 Since then, we have implemented this
23 process and tested this process at the three plants;
24 that is Farley, ANO Unit 2, and D.C. Cook. We have
25 gotten good feedback from the applicants, so we are

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1 implementing this new process on all applications
2 submitted after D.C. Cook. And today, Kurt Cozens,
3 our Senior Materials Engineer, will brief the
4 Committee on the review process, and how we go about
5 doing things. And Jerry Dozier, our Senior Mechanical
6 Engineer is going to give the Committee a brief status
7 report on updating the GALL guidance document, and
8 other guidance documents.

9 So with that, I would ask Mr. Gillespie to
10 see if he has any opening remarks.

11 MR. GILLESPIE: Yes, let me -- because
12 they guys are going to give you the solution. I'm
13 going to give you the problem, which is, I find,
14 always kind of helpful.

15 Back in 1989 when we were first looking at
16 even having a License Renewal Rule, there was a
17 concept we put in place, and that was give us an
18 application quite honestly that is fairly thin, and
19 keep the supporting documentation on site. And that
20 actually was the basic premise behind GALL, which also
21 suggests that you should keep, if you're complying, if
22 you would, or consistent with GALL, the backup detail
23 should be in the file cabinets on-site.

24 You actually implemented that through the
25 90s, so I might suggest that what we're really doing

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1 is not a new process, but going back to basically the
2 underpinnings of how that rule was written to start
3 with. Some of the problems we saw where you're
4 getting to 250 to 300 RAIs coming in, if that's two-
5 page answers per RAI, that's 600 pages of additional
6 information which probably starts approaching the
7 thickness of the application itself, and so the system
8 needed to be looked at.

9 These guys have done a heck of a job, and
10 what's happened is we moved the furniture and there
11 was more dust bunnies under the furniture than we
12 thought, and that led to a connection made between
13 GALL and the audit process that we were looking at.

14 Just some statistics. GALL used to cover,
15 and I think the licensees are here - there's a fair
16 representation so they can jump in on this - GALL used
17 to cover about 40 percent of the AMRs and AMPs as we
18 kind of were using it up to about a year ago. Then we
19 said you know what, if we're going to update GALL, we
20 should bring some of the past practices, things we've
21 already approved into it and give credit to those
22 things also.

23 With the first pilot that percentage with
24 past practice included, kind of went up to about 60
25 percent. With the second pilot, it went up to about

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1 70 percent. With the third pilot, the applicant was
2 able to demonstrate the past decisions that had
3 already been applied to their situations at close to
4 80 percent. And with the latest Millstone
5 application, while we haven't done the audit there
6 yet, they're claiming 98 percent of their AMRs and
7 AMPs have actually already been decided. And so what
8 we got out of the pilot was some immediate insight in
9 working with the industry, and that's put Jerry on a
10 crash course to try to now bring this insight and this
11 body of information in previous decisions into GALL,
12 which will actually be a significant streamlining of
13 the whole process.

14 The other thing I hope Jerry touches upon
15 is maybe the use of technology. Is GALL a document or
16 a database, is a question we have on the table. And
17 so that's some things we're working with the industry
18 on, and they've done a lot of work to help support
19 that kind of -- answer that kind of question.

20 So one of the things that are happening,
21 the other thing we're not talking about today we have
22 just finished is an audit of the scoping process,
23 looking at duplication between three different units.
24 We're looking at scoping process, the results of the
25 process which was DSSA in the systems people in the

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1 regions, and PT's got some corrective things going in
2 place to try to eliminate some of that duplication
3 he's going to be testing out in the next six months
4 also. So a lot of things came out. When you move the
5 furniture around and try something new, a lot of
6 different things come out. You say why didn't I see
7 that before, but we were too close to it, so in that
8 case it's working very well, so there are a lot of
9 other things going on. You'll see two aspects of that
10 today.

11 MEMBER ROSEN: How many RAIs are we going
12 to have when you're done?

13 MR. GILLESPIE: I think Kurt might be able
14 to give you some examples, and touch upon the portion
15 that the audit team is doing, because we can't --
16 we're only going to cut down the RAIs that are on the
17 portion that they've kind of taken under their wing.
18 And I think I'm going to leave it to Kurt's
19 presentation to demonstrate that. I promised Steve I
20 wouldn't steal his thunder.

21 CHAIRMAN BONACA: Yes. One observation
22 that was made, I noted reviewing some of the LRAs
23 recently, that a lot of proliferation of RAIs was tied
24 to some of the narrow prescriptiveness of the GALL.

25 MR. GILLESPIE: Yes.

1 CHAIRMAN BONACA: For example, fire
2 protection is amazing to me how the GALL prescribed
3 this. You will inspect something every other two
4 months. And then the applicant says well, we do it
5 every three months and it's good enough. And the
6 reviewer says yeah, right. So I mean, that's
7 certainly one way that we never put it on paper, but
8 we recommend that you consider removing that kind of
9 narrow prescriptiveness that forces an interaction
10 where you don't need it.

11 MR. GILLESPIE: Yes. And that's actually
12 a major piece of PT's concept on this, and the way he
13 explains it is even if it's in words, GALL probably
14 covers the right subject matter, but it doesn't have
15 a range. And what we did was manage to write it the
16 first time around, which is okay. You don't know this
17 until you try to use it. Too narrowly we tie things
18 to systems and components and individual requirements,
19 rather than saying stainless steel, certain kinds of
20 stainless steel in a primary chemistry environment,
21 and with hyper temperature and pressure.

22 The system it's in is probably a bit
23 independent of the treatment, or the treatment is
24 independent of the system, as long as it's a safety
25 function. Also, the range of -- an easy one is a 24-

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1 month fuel cycle and you're inspecting it every 18
2 months. Well, the intention was every shutdown, so I
3 think GALL, you're going to see it coming out with
4 more of the concept of a range, where the back end of
5 the range, or the backstop is based on the best
6 science and engineering we could come up with, versus
7 that descriptiveness because well, you know, everyone
8 kind of does this every three months, so let's say
9 three months.

10 Well, let's say three to eight months, and
11 eight months may be the backstop based on the known
12 mechanism, so that's going into it. With that, let me
13 turn it over to Kurt, because he's got some --

14 MR. COZENS: Good morning. I decided to
15 do this old-fashioned way with hard copy slides.
16 Again, I'm Kurt Cozens. I'm a Senior Materials
17 Engineer in the License Renewal Program, and I am also
18 one of the team leaders, leading the Point Beach
19 license renewal application review for our group, and
20 have been an active participant in the development of
21 this improved process. So I'd like to kind of go over
22 the process itself, not necessarily speaking about
23 individual reviews that we're doing at this point.

24 The objective of this presentation is to
25 talk about why we changed, what's changed and what has

1 not, and really we're still doing the same reviews
2 that always have been done. It's a matter of a
3 process to obtain those reviews, and the more specific
4 kind of audit process that we're using in RLEP-B.
5 RLEP-B, if I use that term, is the section which I am
6 in.

7 Basically, what's changed? And I think
8 the best way to demonstrate that is this graphic here.
9 This is a listing of plants that either have come in
10 recently, or we have here, and plants that are coming
11 in in the near future. You see the durations that
12 we're planning to complete these reviews in, our
13 target for a plant that does not have a bearing is a
14 22-month period. You begin to see a great deal of
15 overlap.

16 About here starts hitting about 12
17 applications in-house being reviewed actively at any
18 given time. That's more than we've ever done before.
19 It takes a lot of resources, and as Frank had
20 indicated, we needed to figure out how to take
21 advantage of all the planning that we had done, how to
22 take advantage of the positions that have been
23 established by the staff and the Commission that we do
24 find technically acceptable. So, therefore, this is
25 what has motivated us to move on to this improved

1 process. And having dedicated resources with NRC
2 staff, some additional contracting staff and other
3 reviewers to maximize the effort that we can do here,
4 and make it as efficient as we know how. So
5 currently, we're leveraging our resources and taking
6 advantage of the efficiencies that we could get out of
7 reviewing against the criteria that are established in
8 the GALL report.

9 I presume everybody is familiar with the
10 GALL report from previous presentations, so I wasn't
11 planning to talk a great deal about that. So that's
12 why we have a new process in-hand.

13 First of all, I'd like to capture the
14 thought of what has changed and what hasn't. So we
15 can just focus on the changes that have been
16 implemented, and not those where nothing has changed.

17 So one of the things that we're doing,
18 we're standardizing the approach. We are dedicating
19 resources and review teams, and this is a very key
20 thing. We have very much kept low to the schedule;
21 whereas, a traditional review may have taken a year
22 plus to do the technical evaluations, and let's get to
23 the 95, 98 percent closure rate. We are pressing this
24 into now about a 6 to 7 month period, shaving off
25 quite a few months of effort by having these dedicated

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1 resources. And as a result, there's a different
2 division of work that had not existed previously.

3 This is a graphic that shows basically
4 what has changed. These are all the different steps
5 that have to be done in the reviews, the application
6 acceptance, the scoping and screening activities, the
7 scoping and screening results, aging management
8 reviews. Aging management, I'm going to use the
9 acronym, AMPs. That's what these are. These are the
10 programs. Excuse me, these are the line items and
11 these are the programs, aging management programs.
12 Finally, the aging analysis and environmental
13 assessment.

14 If you look at this column here, you will
15 see that the original groups that would have performed
16 the reviews, we only have DE that would have performed
17 the entire review for these activities, and the only
18 change that happens here is the division of labor that
19 changes with the review of the AMPs and the AMRs.

20 VICE CHAIRMAN WALLIS: This is because
21 these are the biggest parts of the review or what?

22 MR. COZENS: This is where we're able to
23 review against the GALL report, and to use NRC prior
24 approved position.

25 VICE CHAIRMAN WALLIS: So these are the

1 ones which you can accelerate. Is that --

2 MR. COZENS: Yes. Thinking again of
3 decisions that have been made, and confirming and
4 auditing against those.

5 The AMP assignments and AMR assignments
6 are based upon those that are consistent with the GALL
7 report, we have been able to identify that the AMP
8 itself is consistent, or the AMR line item is, and
9 where we have NRC approved precedence.

10 Basically, Jerry is going to be talking
11 about the updated GALL, and the next presentation, Joe
12 Dozier over here. And these are the things that
13 we've agreed are acceptable. We'd like to move them
14 into our envelope and within the GALL report. We
15 believe that the biggest bang for the buck would be to
16 get this updated so that the applicants can, indeed,
17 use that and make their reviews and application
18 development much more efficient.

19 Those things are -- and there are some
20 exceptions. I'll talk about these later, but the
21 other things, those things that do not fit in this
22 category with some exceptions are retained by DE for
23 their review, the category. And as I said, remaining
24 AMPs - in reality I should have put here remaining
25 AMPs and AMRs, line items, that they'll be continuing

1 to perform evaluation on.

2 MEMBER FORD: Excuse me. Just for those
3 of us who aren't intimately aware of the organization,
4 what's the difference in the personnel between RLEP-B
5 and DE, and their expertise?

6 MR. COZENS: That is a better question.
7 Because in reality, many of -- we have people who
8 hired contractors to help do some reviews, and I'll be
9 getting into that in more detail. In many cases,
10 those reviewers are one and the same people, so we are
11 always using what we would consider highly experienced
12 engineers to do the reviews. They are familiar with
13 the process, familiar with the plants. That is the
14 criteria to be a reviewer on this.

15 MEMBER FORD: Because the way I read this
16 slide, the RLEP-B people just essentially doing a
17 check down a list; they did this, they did this, they
18 did this. Whereas, the DE people are taking judgment,
19 engineering judgments and analysis.

20 MR. COZENS: Both will require some level
21 of judgment. Obviously, there is more precedence with
22 GALL and the NRC approved positions that you can
23 confirm it, but one has to look carefully, is that
24 truly a match. And to do that, you have to have
25 technical understanding and experience base to ask

1 intelligent questions. So before this might have been
2 performed by DE. This has been removed from their
3 assignment list, so that they could be freed up to do
4 some of the other assignments that really do require
5 some of their other technical expertise.

6 MEMBER FORD: So I should read into RLEP-B
7 is subcontractors. Is that right?

8 MR. COZENS: Not totally, and I have a
9 split on the group. I could show you that later.

10 MEMBER FORD: Okay.

11 MR. COZENS: This is another paragraph
12 that kind of shows what has happened. As I think
13 Frank mentioned, these are some examples of the splits
14 of where the work is now being assigned; whereas, in
15 the traditional approach, 100 percent of this work
16 would have been performed by DE. Now about on the
17 order of 20 percent is retained by DE, and about 80
18 percent has shifted over to being worked by the RLEP-B
19 group. Same in AMPs and AMRs, fairly proportional.
20 And this seems to be holding, regardless of the
21 percentage the people have coming in. And I'll
22 explain the reason for that shortly.

23 I thought I'd provide an overview for you,
24 kind of demonstrate the process in more detail. As I
25 had indicated, you had asked about who's on these

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1 teams. We have an NRC team leader, which is just
2 somebody that is knowledgeable about the process, the
3 decisions that have been made in the past, how to work
4 it. We'll always have a backup team leader on this.
5 That will be an NRC staff member. That's because
6 these are very important reviews, people move around
7 on the staff, and somebody needs to be prepared to
8 carry the ball, should changes occur.

9 We always have five engineering
10 disciplines, in addition to these two positions, that
11 will be manned on each of these teams. Sometimes it's
12 more, but it will be these minimum areas. These are
13 the areas that basically match up with the split in
14 GALL, and how the different --

15 VICE CHAIRMAN WALLIS: Is this because the
16 leaders have no disciplines?

17 MR. COZENS: No. I am the Senior
18 Materials Engineer and have experience, but I have to
19 be broad-based also.

20 VICE CHAIRMAN WALLIS: It seems to me the
21 backup leader could be one of these engineers.

22 MR. COZENS: Sometimes it is, but there's
23 a lot of administrative activities that go along with
24 this, so this backup team leader may be on multiple
25 projects also. It's not necessarily 100 percent

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1 dedicated to this. Matter of fact, some of our team
2 leaders are dedicated to multiple projects too, a lot
3 of things going on.

4 But in these interviewers, we also have
5 staff members that man these positions, as well as
6 contractors. We have staff in RLEP-B. In some of the
7 pilot plants, we did have some members of DE accompany
8 us to help do some information transfer as we're
9 implementing this program. But these individuals will
10 always be senior individuals, many years of
11 experience, lots of plant experience, and we try to
12 make certain they also have explicit experience in the
13 license renewal arena.

14 I just want to point out the activities
15 that happen as you establish a team. First of all,
16 you have to know the team, which means not only do you
17 have to have names of individuals proposed to support
18 this, you really have to review who they are and
19 approve them. We have not always approved every name
20 that has come to us from either internal staff or a
21 contractor.

22 As I said, one of the goals that we're
23 doing now is to standardize the process where we can
24 really demonstrate what it is we're doing in hard form
25 that could be retrieved in the future. And so we

1 prepare a very detailed audit and review plan that
2 quite frankly turns out to be about two inches in
3 thickness. About less than a third of it is actual of
4 the how-tos, and the other thickness happens to be the
5 set of all the tables, and the work splits on line
6 items. As within any given table, there would be line
7 items that are retained by DE, and line items that are
8 assigned to the RLEP-B team, and this is a little bit
9 of a bookkeeping on who's responsible for what.

10 We will also then review prior SERs that
11 have been put out, understand what type of
12 documentation we will want on any given issue, have
13 discussions and determine the things we want to look
14 at closely. We will perform the reviews, and I'm
15 going to talk more about this in the process of how do
16 we do this, and what are some of the differences of
17 how we're performing our reviews. And then we're
18 trying to standardize on the documentation of our
19 work, both the new product which will be an audit
20 report, and then the SER input that we will be
21 providing to the overall PM that has responsibility
22 for pulling together the complete SER on the reviews.

23 And, of course, we'd like to have feedback
24 loops, what's working well, what isn't, and how do we
25 improve the process.

1 MEMBER POWERS: When you talk about
2 improving the process aren't you talking about the
3 efficiency with which you go through the thing?

4 MR. COZENS: That's correct. Our reviews
5 are all centered on 10 CFR 54.21(a)(3), which
6 basically says we have to be able to manage these
7 components for the stated period, and make certain the
8 CLB is maintained.

9 MEMBER POWERS: What you're proposing is
10 to change this process, to make it a little more
11 efficient, a little easier.

12 MR. COZENS: Absolutely.

13 MEMBER POWERS: And, of course, the
14 question is, is it an effective review still, or not.
15 And do you have a mechanism to go back and say okay,
16 these teams who are composed of members stretched
17 seven letters from Sunday, doing multiple projects
18 simultaneously, did this review. How well did they do
19 it?

20 MR. COZENS: We have a couple of new
21 documentation formats that we've implemented on our
22 standardized approach that are helping us do this. We
23 look at GALL and figure out what it is that is indeed
24 auditable. GALL was established as something that if
25 you are consistent with it, then you need no more

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1 further technical review. And that's the process of
2 GALL that was put in place by the Commission, I
3 believe it was probably reviewed by you, the ACRS, as
4 it was going through the process. And now it's time
5 to be implemented in that format, so we do a very
6 careful review of what it is that we need to be
7 auditing.

8 We've asked our reviewers to document on
9 their worksheets actually what they looked at and
10 where did they find these things, so we would have
11 some level of traceability if we had to dig back to
12 the internal records to find out where did they
13 confirm that this thing exists.

14 We also have experienced people, as I
15 mentioned, and there's always an overriding criteria
16 that you need to satisfy 54.21(a)(3), and is it
17 anything you're seeing that is not consistent with
18 good technical logic of why this is an appropriate
19 program to manage the aging effects. So we do,
20 indeed, look at --

21 MR. WEST: Well, I think what I'm asking,
22 let me add to that if I could, maybe I'll get your
23 question, Dr. Powers. A couple of points I'd like to
24 make. First, I hope we didn't give you the impression
25 that the team members are stretched thin.

1 MEMBER POWERS: They're stretched. Come
2 on.

3 MR. WEST: No, seriously.

4 MEMBER POWERS: Everybody in the
5 organization is stretched.

6 MR. WEST: They've very busy because
7 they're working on the reviews, but the idea is to
8 have these dedicated teams that Kurt mentioned. And
9 the primary work responsibility for a team member is
10 that review for the plant he's assigned to. He may be
11 doing other things, but really prior one is the
12 review. And that was one of the main principles that
13 goes behind this process, to have the dedicated teams
14 and the people available and the right focus on the
15 review. So I think we have achieved that.

16 As Kurt mentioned, we have had DE
17 participation actually in all three of the pilot
18 reviews that we're doing. And we're still in -- we
19 have a lot of communication with DE still to look at
20 the review questions that come up, look at
21 effectiveness. We have DE involved in doing peer
22 review of the team's work, so we have that process in
23 place, and we're learning from that.

24 The other thing is that the teams are
25 highly experienced, as Kurt mentioned, and qualified

1 engineers that have been involved in license renewal
2 and are doing the work in that regard.

3 MEMBER POWERS: But you have never said
4 okay, let me put together a team. These guys did this
5 review, your guy, is it was fine. Everybody signed
6 off on it and things like that. Put together an
7 independent team, a bunch of guys that didn't do that
8 work, and go check it. See how good it is. Find out,
9 you know, highly experienced people, they overlook
10 things, every once in a while I'm told.

11 MR. WEST: We thought you did that,
12 reviewed our work. There's a couple of other things
13 we've done too. We have regular meetings with
14 industry where we review the process and review
15 lessons learned, look at the effectiveness of the
16 process. And we do have in place a plan to do an
17 assessment of the process when we get finished with
18 the three pilots, when we get through those three
19 reviews. And your question could give us -- stimulate
20 some thought when we get into that assessment of the
21 process.

22 CHAIRMAN BONACA: Until now the inspector
23 is going on site and spending weeks there. Are you
24 going to still have that taking place?

25 MR. WEST: Well, that brings up a good

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1 point. One other thing I think Kurt is going to talk
2 about in his next slide, is that one thing the team
3 does is that most of the team's work is done on site,
4 getting back to Dr. Powers' question. So there's a
5 whole different interaction that takes place between
6 the reviewers and the applicant that results in a very
7 effective review.

8 CHAIRMAN BONACA: My question was going to
9 the point that if you had also an inspection team
10 going in to verify, then you would have already the
11 verification of whether or not implementation and the
12 problem.

13 MR. WEST: Right. I just wanted to -- you
14 made a good point. I wanted to make sure I capture
15 that in the context of Dr. Powers' question. We have
16 looked at, as Frank mentioned in his introductory
17 remarks, we have been looking at what the regions and
18 the NRC headquarters reviewers are doing, in trying to
19 identify overlap. And we do have plans to do a more
20 formal review of the inspection program against the
21 review program, look for overlaps or duplication work,
22 and make adjustments to whichever program is
23 appropriate to eliminate that.

24 There still will be a need to send
25 inspectors in to look at things that the reviewers

1 aren't looking at. Where they may look at actual
2 implementation of a program, where we're looking at
3 the program from a reviewer's perspective.

4 DR. KUO: And just to add to what Steve
5 just said, we have a team assessing the effectiveness
6 and the efficiency of the review of the screening and
7 scoping part, because we sensed that there might be
8 some duplicate effort between the region and the
9 divisions in the headquarters. And that assessment
10 has been done, completed, and it is -- we are going to
11 start to implement it as soon as we have the guideline
12 established.

13 MR. COZENS: If I might continue, it was
14 mentioned by Steve is the fact that we have -- these
15 are questions now. It sounds like a simple statement
16 but it's very significant. Our traditional process
17 has been to use RAIs, that the contractor was doing
18 the review for the staff as frequently is the case,
19 that it be approved by their management, then if you
20 transferred it to staff, it be approved by staff,
21 submitted to the applicant, reviewed by the applicant,
22 answers be generated, reviewed and signed, concurrent
23 signature. That, quite frankly, could take anywhere
24 from four to six months to get a response back.

25 By the time the individual got the

1 response back, they're asking themselves why did I ask
2 this question even because they've been on to three
3 different projects since then. So it was this
4 difficulty with the streamlining the communication.
5 The project teams now go to the site. They do our
6 audits and reviews, and the AMPs and the AMRs as
7 appropriately on site. And they have an opportunity
8 to interface in a face-to-face manner with the
9 licensees.

10 This is an opportunity to take care of
11 some of those RAIs that would truly qualify. Show me
12 where this is in your application. These are huge
13 documents, difficult to know exactly where everything
14 is, or explain the logic. I'm not certain I
15 understood it, but yet you may be right. Just tell me
16 a little bit about what you put into place.

17 MEMBER POWERS: When you get those in,
18 just send them to me. We need this mechanism. How do
19 we get this?

20 MR. COZENS: The point being that the
21 efficiencies of dealing face-to-face with counterparts
22 of the plant are very valuable, very efficient, and
23 resolve a great percentage of the type of questions
24 that pop up as you're just looking at a piece of
25 paper.

1 CHAIRMAN BONACA: That should also reduce
2 the size of the SER, I mean because the SER, many
3 pages are there to describe, in fact, the interaction
4 on RAIs, as a means of documenting that flow path.
5 And at the end of it when you read it, you say okay.
6 All right. And I would expect that this interaction
7 of verification would even be documented at some
8 point.

9 MR. COZENS: As appropriate, those
10 documentations work. When you have information that's
11 necessary to make a finding, if it's not in the
12 application, it needs to be put on the docket so that
13 it can be referred as a basis. If it's just a general
14 exchange of understanding on how the plant is set up,
15 it may not be necessary always to document that level
16 of detail. But we have these questions, we do get
17 documentation on them for our own use. And as
18 appropriate, we would either see if the applicant is
19 willing to voluntarily submit these and put them on
20 the docket. And frequently, they've identified that
21 before we even did. They realized the significance of
22 what's being asked, maybe it's an error or omission,
23 or just something that really builds their case to
24 really support it. That's usually done. But for
25 whatever reason the applicant does not choose to put

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1 it on the docket, we always have the use of RAIs that
2 we may apply to this and we do, indeed, do this.

3 On the first pilot program, I think it was
4 Farley, I think we had -- I believe it was four RAIs
5 total in our reviews for AMPs. And, Ken, was that
6 also AMRs? That also included AMRs? Yes. And those
7 were what resulted after some draft RAIs were issued
8 and we were able to have some discussion on those.

9 MEMBER ROSEN: Did you say you had four
10 RAIs on Farley? Only four?

11 MR. COZENS: Four, the pilot which in that
12 case I believe it was about 63 percent of the overall
13 safety evaluation.

14 MEMBER ROSEN: Going from hundreds to four
15 are you saying?

16 DR. KUO: I just want to clarify. These
17 four RAIs is only from the audit teams.

18 MR. COZENS: That's correct.

19 MEMBER ROSEN: Okay.

20 MR. COZENS: Not the DE or DSS.

21 MEMBER ROSEN: Okay. Let me ask another
22 question about when you have a question. Do you
23 actually write it down? Is it documented, or is it
24 just a verbal thing?

25 MR. COZENS: It could be both. You will

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1 frequently start with a written question, and through
2 sitting across the table, you'll have follow-on
3 exchanges that will happen. And those will frequently
4 -- it depends on what it is, to be honest. It's a
5 level of discretion --

6 MEMBER ROSEN: See what I'm getting at,
7 where I'm headed with this in my thinking is the
8 implications of all this to our review, because you
9 may not know it, but we do spend a considerable amount
10 of time looking at your work.

11 DR. KUO: I'm sorry. At the end of this
12 audit, they prepare an audit report, very detailed
13 audit report, document the discussions and the
14 findings. And that is on the docket.

15 MR. COZENS: Yes.

16 MEMBER ROSEN: So we would get that in
17 addition to what we now get?

18 DR. KUO: Yes, sir.

19 MR. COZENS: That's a new type of product
20 that did not previously exist.

21 VICE CHAIRMAN WALLIS: We have been
22 getting site visit report, which I found very, very
23 useful.

24 MR. COZENS: I believe those would have
25 been probably the same --

1 MEMBER ROSEN: Those are inspection
2 reports. Right? What you're referring to, Graham, is
3 the inspection reports?

4 VICE CHAIRMAN WALLIS: Is that what --

5 MEMBER ROSEN: Like Caudle Julian does?

6 MR. GILLESPIE: Let me just get it right.
7 We did site audits before we actually went into this
8 program because the comment from OGC, and this is
9 something interesting, audits are not optional. OGC's
10 comment was that if you make a finding that GALL
11 applies, then it's okay. You need to be able to go
12 and do enough work to say that GALL actually does
13 apply as claimed by the site. And so I think you saw
14 some report on Summer, Robinson, and there might have
15 been one other, in Ginna, which were shorter reports.
16 I think you're going to see that the audit reports
17 from these guys are almost as thick as the SC that you
18 used to see. It's a very, very detailed audit report.
19 They're covering a lot more scope, and a lot more
20 detail. Those went to more of a confirmatory site
21 visit to make sure that GALL was, in fact, applicable
22 to the plant as was claimed. A lot more detail in
23 these.

24 MEMBER ROSEN: Does that mean we get to
25 read even more paper?

1 MR. GILLESPIE: Yes. And that's what I
2 wanted to put in - yes, you will now have probably 50
3 percent more paper to read.

4 MR. COZENS: The goods news is, and I'll
5 talk to this a little bit more later, is a great deal
6 of the audit report gets transferred into the SER,
7 because you're not reinventing the information.
8 You're selectively adding what needs to go formally
9 into the SER.

10 MEMBER POWERS: Can we make it a staff RAI
11 process?

12 CHAIRMAN BONACA: We'll have to streamline
13 that process.

14 MEMBER ROSEN: I'm still trying to figure
15 what's in it for us. So far I haven't heard much
16 positive.

17 MEMBER FORD: Could I backtrack to an
18 earlier question Dr. Powers brought up? I understand
19 the idea of going to increasing efficiency, but it has
20 to be done without impact on effectiveness. And the
21 way we seem to be going is in one of your earlier
22 tables, relying more and more on external contractors
23 to do the technical reviews. And that, therefore,
24 depends on their technical proficiency. How are you
25 going to assure that these external examiners or

1 contractors are working to the required technical
2 competency?

3 MR. COZENS: I believe all contractors
4 that we've hired to date were originally working for
5 DE and performing the same type of reviews. We're
6 using some commercial contractors, but we're also
7 using national laboratories contracted previously by
8 DE to do similar work.

9 MEMBER FORD: But you're not going to be
10 asking them to do more work. Is there some sort of
11 internal review process that you do check that things
12 aren't slipping under the rug?

13 MR. COZENS: We examine their worksheets
14 when we're at the site to see what type of work
15 they're doing, a sanity check. We frequently
16 participate in the interviews with them as a form of
17 control, and look at their questions that are posed in
18 advance, and have some idea of what's covered, and
19 also look at the consistency and how we treat things.

20 MEMBER FORD: Okay.

21 MR. CHANG: The process we are
22 implementing requires two checks.

23 DR. KUO: Identify yourself, please.

24 MR. CHANG: Oh, my name is Ken Chang. I'm
25 in RLEP-B, and I'm the audit team leader currently for

1 Three Plains and for all this review process, I
2 participate in every audit on site, including Farley
3 -- no, including Ginna, Robinson, Dresden, Quad City,
4 and V.C. Summer. Every one.

5 Before the audit team is formed I, as the
6 tech manager, I review every team member's
7 qualifications, their background, and if we have to,
8 we check their qualifications and references. And
9 when the auditing team is going on, we review the
10 qualification and the work they do and the attitude
11 they take in reviewing this process, and if we find
12 someone who is not capable or not qualified, or not
13 doing a good job, we get rid of them right on the
14 spot, or we come back and we don't accept them for the
15 next audit. So we do a screening process to verify,
16 to make sure the people we got is really qualified
17 people. Otherwise, how do you think the audit team
18 leader will function. If that staff is bad, the
19 product is bad, the team is bad. We cannot tolerate
20 that, and we are not tolerating this.

21 MR. COZENS: Thanks, Ken.

22 MEMBER SHACK: Again, direct question.
23 What fraction of the team is NRC staff, and what
24 fraction is contractors?

25 MR. COZENS: We've had as much as 40 or 50

1 percent of the team being NRC. We've had as little as
2 25 percent of the team the NRC.

3 MR. WEST: Kurt, I'd like to just make
4 sure one thing is clear. All the contractors that
5 we're using have not been involved in the reviews for
6 DE before. Some have and some have not, but we do, as
7 Ken said, for any contractor that we use, we do review
8 their qualifications and assure ourselves that they
9 are qualified and capable of doing the work we're
10 asking them to do.

11 I think another kind of main point is that
12 virtually all of the work that's being done is being
13 done by a team working together so there's always the
14 NRC team leader, and usually a backup, and usually one
15 or two other staff participating in the team, so
16 there's a lot of opportunities to observe and
17 participate in what's happening.

18 DR. KUO: And I also want to say these
19 team leaders are very senior people, many years of
20 experience, and they themselves are technical experts
21 in one or two areas.

22 MR. COZENS: As I had mentioned before
23 we're trying to standardize. One of the things that
24 we've implemented in this process, which I do not
25 believe has been formally done, and definitely not to

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1 the level and detail that we're doing it now, is the
2 development and issuance of the audit and review plan.
3 This is a large document, very explicit on the details
4 that are being done. It includes a process, drawing
5 diagrams and how to do different types of reviews,
6 worksheets and checklists, and guidance for reporting
7 results and review.

8 This is to assure that we have a minimum
9 level of review and control over the process as
10 different individuals become involved, that if there
11 is a question we can go back in the guidance that we
12 provided our reviewers to take. So this is now
13 available. I think the first one will be going in the
14 PDR this week, although all plants have indeed had
15 them developed and been through the polishing phase on
16 this. Now we have templates that we are following.

17 I will be glad to go on in time, but I'm
18 a little bit concerned about time for Jerry, so as
19 appropriate, I can either go quickly, or you could
20 tell me if you wish to hear about this. I wanted to
21 talk about some of the detailed forms we review, and
22 how they're actually performed, so with your
23 permission, I'll continue.

24 On the AMP reviews, if it's consistent
25 with GALL, the criteria is to match GALL program

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1 elements that have explicit criteria that a program to
2 be considered consistent with GALL would need to meet.
3 I would note that the audit, the RFB reviews seven of
4 the ten program elements. There are three program
5 elements that we do not review. They'll be like the
6 corrective action program, quality program, the
7 confirmation process. Those three are cross-cutting
8 and they are reviewed, I believe, by DIPM. So those
9 are reviewed elsewhere, as they have always been
10 reviewed.

11 We look very carefully at the exception
12 enhancements identified by the applicant. We look for
13 the technical bases for those. We look also for a
14 process to find out if those were acceptable
15 previously, or if the basis is sound and robust, and
16 the discussions that are necessary. And the
17 corresponding documentation will be found on those.

18 If the audit team, and the project team
19 finds differences that were not identified by the
20 applicant, they're treated as if it was an exception,
21 and reviewed on the same bases, and documented on the
22 same bases.

23 As to specific AMPs, or those AMPs that
24 are not consistent with GALL, the only reason those
25 would be assigned to the project team is if they're

1 based upon a past precedence. Those would be reviewed
2 in a similar manner. The intent would be that
3 ultimately these AMPs would essentially be captured by
4 GALL. There could be some exceptions to that, but
5 that would be the long-term intention.

6 AMR reviews, I'll note that typical
7 applications contain something between, I believe,
8 2,200 and 2,500 AMR line items. Quite frankly, this
9 is just a roll-up-your-sleeve-and-work type of
10 activity. Each line item represents components,
11 materials, the aging effects, the program that's being
12 used to manage it, and they need to be confirmed if
13 they're adequate. This is the part of the regulatory
14 review, this is where you're really confirming that
15 you're satisfying the 54.21(a)(3) criteria, so we take
16 these very seriously and we go through all line items
17 that are assigned to us.

18 For the project team at an 80 percent
19 level, it's basically about 1,800 line items. We will
20 check that they are consistent with GALL. And in GALL
21 you may remember, some of the line items have a
22 further evaluation. Those are reviewed against the
23 criteria established in the standard review plan, and
24 they are documented if they are, indeed, consistent
25 with that. And if it's based on NRC approved

1 precedent, we will look at that from a technical
2 perspective to assure ourselves that these are still
3 defined as being sufficient for managing the aging
4 effect.

5 The AMR line items, they are a form that
6 if we are doing precedent reviews, that we can start
7 in the office. This is another efficiency that we
8 take when those are placed in the public document room
9 in ADAMS, because we are able to do reviews and only
10 identify questions associated with those reviews.
11 Then when we go on site, we directly interact with the
12 applicant to deal only with questions, not where we
13 have agreement already. And the site visit is
14 critical to this activity, very important, these face-
15 to-face interactions.

16 It permits the large number of questions
17 that come out of these reviews, and there are
18 numerous, to be addressed, discussed, and resolved in
19 a large haul. Occasionally, we find errors and
20 omissions that need to be addressed, and the applicant
21 usually is very forthright in seeing what solutions
22 would be acceptable, and putting those on the docket.

23 My last slide, the most important one to
24 you guys, is documentation, small packages. We have
25 the new product of the audit and review report. That

1 documents all their efforts and all the reviews that
2 were assigned to the RLEP-B project teams, they
3 document the reviews in as streamlined a fashion as we
4 could get, but yet making certain that we have
5 sufficient justification to explain why are we
6 accepting these things? Or if there's open items,
7 what are the open items, and they will always be
8 linked to a RAI at that point.

9 You either in this report will be closing
10 out an item, or having an open RAI. And those RAIs
11 will have to be resolved. This information is largely
12 carried into the SER input. There are some exceptions
13 on what documentation we carry, that is in general.
14 This is a good preview of what you will see here.
15 When we write our SER inputs, we will be writing up
16 Sections 3.0 through 3.6 as they apply to the line
17 items that were assigned to us, and we will always
18 address each and every RAI, or actually I should even
19 include docketed material that are necessary to
20 support this. That concludes my prepared remarks.
21 Any further questions?

22 MEMBER ROSEN: I guess I was being serious
23 about this. If the staff intends to make their work
24 more effective and efficient, how is it helping us?
25 How could we benefit from it to make our work more

1 effective and efficient?

2 MR. COZENS: PT, did you wish to say
3 something?

4 DR. KUO: Yes. Dr. Rosen, the way I think
5 about this is that we will generate, as the result of
6 an audit, we will generate an audit report which
7 basically documents the interaction between the audit
8 team members and the applicant. And I hope this audit
9 report, you use it as a reference document. You don't
10 really need to review it, audit report. This is
11 really a detailed interaction between the team members
12 and the applicant's staff.

13 Another thing I want to clarify is you
14 asked a question about you got only four RAIs as a
15 result of an audit? Yes. The four RAIs are the
16 formal request for information. The reason that we
17 issue that is for the certain documentation to be
18 placed on the docket. In-between there are a lot of
19 commitments made by the applicants also. During the
20 audit they say okay, this may be wrong, we're going to
21 change certain things. So all these commitments are
22 also documented in the audit report, and that would be
23 later on transferred into the SER.

24 So I think for the purpose of the
25 Committee, all you have to review is really the SER.

1 The SER itself will capture the essence of the audit
2 report findings.

3 CHAIRMAN BONACA: Okay. We're ready to
4 move on to the next presentation. I understand there
5 may be also comments from the industry. Okay. This
6 is now dealing with updating license renewal guidance
7 documents. I understand they would be probably ready
8 later in the year, these documents.

9 MEMBER ROSEN: The schedule.

10 CHAIRMAN BONACA: Oh, okay. Just I was
11 thinking about when we would be reviewing them. Okay.

12 MR. DOZIER: Good morning. My name is
13 Jerry Dozier. I am the Project Manager for getting
14 this out for this year, as you just mentioned. And
15 I'd like to go over a few minutes of what's going on
16 with it.

17 Of course, all of us know about GALL and
18 SRP, and we'll change the GALL report, change
19 associated information with the standard review plan.
20 While we're doing this, basically we've reviewed a lot
21 of applications, learned a lot of things. We've got
22 out past precedents that we've approved before. We've
23 approved them several times. Why not go ahead and
24 capture these ideas, and incorporate them into the
25 GALL report, and use those lessons learned.

1 We talked about, in Kurt's presentation,
2 how this could improve our efficiency, the NRC
3 efficiency, and the review. Also, industry has asked
4 and they're very much wanting to see a draft of this
5 on our web by the end of September. They have also
6 made a submittal to us on some of their ideas on how
7 this may be performed, so we have both the NRC and
8 industry wanting to increase our efficiency and
9 effectiveness in this review process.

10 For the scope of this change, it will
11 primarily involve the low-hanging fruit. It will be
12 the decisions that have already been made by the
13 staff. It will be obvious corrections that we need to
14 do, a little bit of reformatting to make it a little
15 easier, and also to consolidate some of the
16 components. Sometimes the components were very
17 specific and now in this review process, it will be
18 well, it's just like GALL, but it has the same
19 material, environment and aging effect, and it's in
20 the same system, but the component wasn't
21 incorporated.

22 With a little bit of generalization, we
23 feel like we can solve those problems. And that is
24 low-hanging fruit, but it takes away from these
25 diversions in the applications to just speak of

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1 nuances or differences in GALL. And I think that
2 these generalizations are probably more of the essence
3 of what we really meant in the first place when we
4 wrote the document. And again, we'll change the SRP.

5 CHAIRMAN BONACA: Although I saw something
6 important in the slide. I mean, you pointed out that
7 you're going to include the interim staff guidance
8 documents. Those are important guidances, and you can
9 just see the many applications that repeat issues with
10 items which are in that guidance, so that would be
11 implemented in GALL.

12 MR. DOZIER: Right. The ones that have
13 been approved actually at this point is five,
14 hopefully then we'll have some more, but yes. In
15 other words, these are not positions that we have to
16 argue about. They are our approved positions at this
17 time. Yes, sir.

18 What we're focusing on doing, and I am a
19 dedicated resource to it. I'm part of RLEP-B, but
20 they have dedicated me to this effort, as well as the
21 funding and other folks to do it, but our intention is
22 to have something on our web for the end of September.
23 And then for the final documentation, we expect it to
24 be issued early 2006.

25 CHAIRMAN BONACA: When would they be

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1 usable? I mean, we have to wait until 2006?

2 MR. DOZIER: We'll have our stated
3 positions. Basically, what you'll see in the
4 September time frame is the NRC review, and this is
5 how we propose it to be. Can they use it?

6 CHAIRMAN BONACA: I don't understand what
7 takes place between September 30th --

8 MR. GILLESPIE: Yes, let me -- we haven't
9 figured that out yet.

10 CHAIRMAN BONACA: Okay.

11 MR. GILLESPIE: But clearly, with the
12 emphasis on the first one as a low-hanging fruit and
13 already approved positions, I think what you're going
14 to see is GALL turning more into a continuous
15 document, rather than some major event every five
16 years, that after every review we take the lessons
17 learned from that review and fold it in. We haven't
18 figured out quite how to do it, but given in its
19 previously approved positions, we're trying to press
20 to get on the web by September. GALL traditionally
21 has been put out for public comment, but even the
22 industry isn't going to be able to have too many bad
23 comments on something we've already approved. And so
24 I have a feeling we're going to have some shortcut
25 method for at least some phase of it, that would allow

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1 it - I'm going to call it Revision 1 - to go into some
2 rapid kind of use.

3 CHAIRMAN BONACA: Is the ACRS going to be
4 involved in this review? I mean, people will want to
5 review it.

6 MR. GILLESPIE: Yes.

7 CHAIRMAN BONACA: That will be in the
8 fall.

9 MR. GILLESPIE: Yes, it will be in the
10 fall. Well, we want to give the industry a chance to
11 look at something on the web. And we're actually
12 toying with the difference between a paper document
13 and a database now, which would make the material much
14 more accessible. In working with the industry,
15 they've got some ideas, and some actually
16 demonstration projects that they've done themselves at
17 different utilities. But we would hope we wouldn't
18 necessarily have to do a whole lot if we stay pure to
19 the previous approved positions to argue over those,
20 so yes. Get those out as rapidly as possible, go
21 through all the comment processes. We're not going to
22 shortcut anything, but we're looking to get something
23 out earlier for use.

24 CHAIRMAN BONACA: Good.

25 MR. DOZIER: So not only will they have

1 the regular 60-day period for comment, but really
2 they'll have a much longer period. So all
3 stakeholders involved will have a good opportunity to
4 have input into these documents.

5 CHAIRMAN BONACA: And at that time, the
6 October time frame, you'd come to us with a
7 presentation so we understand the changes.

8 MR. GILLESPIE: Yes. As Steve said, don't
9 burden me with too many presentations.

10 CHAIRMAN BONACA: All right.

11 MR. GILLESPIE: Sometime in there, yes,
12 we're going to be back. I think the other thing Jerry
13 has got up there, which is an important set of words,
14 is bases document. Relative to human capital, things
15 you see about documenting why what it is, the way it
16 is. Even looking at GALL today and some of our SCs
17 that we've written, we haven't necessarily had to went
18 back to what the science and engineering basis of the
19 acceptable program is. And that's going to take a bit
20 longer. That likely will take fully to 2006 to pull
21 that additional documentation together. That's
22 probably a more significant document and work, than
23 GALL itself, as kind of a decision and criteria
24 document. So with that, let me ask Steve to undo what
25 I just said.

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1 MR. WEST: This is Steve West. I just
2 didn't want you committing to a date. Actually,
3 there's a number of steps that need to be taken
4 between September and early 2006, that are just driven
5 by our process for issuing this type of document. But
6 we definitely do -- one of the steps in the process is
7 definitely to bring to the ACRS the proposal that
8 we're making for the update, and to have your review
9 and comment. And I don't have the detail -- we have
10 a detailed schedule of milestones, which I don't have
11 with me, but we're definitely planning to come back
12 here sometime after September, but before the end of
13 the year with that document to make a presentation.
14 And we'll probably come back and provide some more
15 information before September, and let you know a
16 little bit more about what we're planning to do.
17 We're kind of in the preliminary stages now of
18 reviewing NEI's proposal and staff proposals, and
19 developing the framework for what we're going to put
20 together. And I think we'd like to come back and
21 explain a little bit more to you technically later
22 this summer.

23 CHAIRMAN BONACA: Okay. Thank you.

24 MR. DOZIER: Any other questions?

25 DR. KUO: That concludes the staff's

1 presentation.

2 CHAIRMAN BONACA: Any other questions from
3 members of the public?

4 MR. EMERSON: Fred Emerson from NEI. I
5 have the privilege of working license renewal, as well
6 as fire protection. The industry has been very
7 supportive of the staff's efforts to create a more
8 efficient review process, and we've had numerous
9 meetings with them to try to achieve that goal.

10 As with any new process, there have been
11 a number of lessons to learn, and we've had regular
12 meetings with the staff, as Steve indicated, for us to
13 provide feedback on things that we thought could be
14 improved with the process. And the latest in a series
15 of a such meetings is tomorrow.

16 In general, we applaud the staff's efforts
17 to improve the review process. Ultimately, it's a
18 success for industry and NRC both if we make it work
19 because of the level of resources that are being
20 applied on both sides of the regulatory fence.

21 On the industry side, ultimately you would
22 like to see reduced costs in terms of what the
23 licensee direct costs and the NRC review cost, and
24 we're hopeful that the process will result in that
25 when all is said and done, so we are supportive and

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1 working with the staff.

2 There is one point I'd like to make about
3 consistency with GALL. It is a significant effort for
4 a licensee to, in his application, demonstrate that he
5 is consistent with GALL. And an improved GALL will
6 certainly enhance the licensee's ability to do that.
7 But I just wanted to make it clear that this is not an
8 effortless process to do this, so we want to be sure
9 that the GALL process is as efficient as possible, so
10 that it reduces the amount of work for both the
11 licensee to demonstrate its consistency, and for the
12 staff to confirm that.

13 MEMBER POWERS: But, Fred, you still
14 haven't told us what's in this for us.

15 MR. EMERSON: Well, if I could quote one
16 of my colleagues, ultimately our goal is either
17 reduced cost or reduced schedule, or both.

18 CHAIRMAN BONACA: All right.

19 MEMBER POWERS: I think we ought to get
20 cranky until they come up with a process that makes it
21 easier for us.

22 MEMBER ROSEN: In your case, that wouldn't
23 be hard.

24 CHAIRMAN BONACA: All right. If there are
25 no further comments --

1 MR. COZENS: Dr. Powers -- if I may.

2 CHAIRMAN BONACA: Yes.

3 MR. COZENS: Dr. Powers, with the
4 generalization, we expect the GALL report to be a
5 smaller document rather than a bigger document. So at
6 least for the ACRS when they do their reviews, it
7 should be less pages to go through.

8 MEMBER POWERS: Well, I don't know that --

9 MEMBER SIEBER:: We do have a minimum font
10 size.

11 MEMBER POWERS: Making the SER and the
12 applicant's document more readily comprehensible and
13 encompassable.

14 CHAIRMAN BONACA: Yes. I think --

15 MEMBER POWERS: That's the biggest
16 challenge.

17 CHAIRMAN BONACA: We may spring up some
18 comments ourselves.

19 MEMBER POWERS: Yes.

20 CHAIRMAN BONACA: And I think we should do
21 that. I think the proof is going to be when we review
22 the various documents, I think we'd probably come up
23 with some comments, some thoughts.

24 MEMBER POWERS: We could go on strike
25 until they fix it.

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1 CHAIRMAN BONACA: All right. If there are
2 no further comments, thank you very much for your
3 presentation, and we will work with you. And we're
4 going to break until a quarter of one, so 12:45.

5 (Whereupon, the proceedings in the above-
6 entitled matter went off the record at 11:46 a.m. and
7 went back on the record at 3:58 p.m.)

8 CHAIRMAN BONACA: We're back in session,
9 and we're going to hear about digital instrumentation
10 and control system research activities. Jack Sieber
11 is going to lead us in this presentation.

12 MEMBER SEIBER: Okay. Unaccustomed as I
13 am to public speaking --

14 (Laughter.)

15 CHAIRMAN BONACA: You got good practice.

16 MEMBER SEIBER: I'd like to give you a
17 little background as to how we got to this point this
18 afternoon. Dana isn't here so I can talk freely about
19 him. But in the process of writing the research
20 report, I have looked at the Year 2000 INC Research
21 Plan with a list of research projects. I kept reading
22 it, trying to figure out, I wonder what it is they are
23 really doing here so that we could comment on it in
24 the research report.

25 So we asked for a meeting with the

1 research folks and had that meeting on March 26 where
2 they went through and explained what some of these
3 projects really consisted of. But I still had the
4 question in my mind as to, "Why are we doing this?"
5 So now, the latest document that we will need to
6 consider is a draft regulatory guide. It's Draft
7 Guide-1130.

8 It's entitled "Criteria for the Use of
9 Computers in Safety Systems of Nuclear Power Plants."
10 This draft guide references an IEEE standard 7-4.3.2
11 dated 2003. Lo and behold in that standard - and this
12 is the industry document - they reference a number of
13 the projects. For example, the software quality
14 metric section is new to this standard. That's one of
15 the things we're going to talk about this afternoon.

16 We've already in the past talked about
17 verification and validation. The fault injection
18 process is mentioned in the standard. We're going to
19 talk about that and a number of other things. So now,
20 we've come full circle. We think we know what it is
21 research is doing. We also now think we know why
22 they're doing it which is very comforting to me.

23 MEMBER APOSTOLAKIS: Well, does everyone
24 have a copy of that?

25 MEMBER SEIBER: No.

1 MEMBER APOSTOLAKIS: I don't.

2 MEMBER SEIBER: No, and we will talk about
3 it later in this meeting as to whether we want to
4 review it before or after public comments. It's a
5 pretty standard regulatory guide. It invokes an
6 industry standard. It does have some words in there
7 about the various steps in the life cycle process of
8 digital I&C.

9 In any event, this document is out there.
10 This is the reason why the research is being done. So
11 with that kind of an introduction, we decided at our
12 March 26 meeting that we would give an abbreviated
13 presentation to the full committee where we could
14 review some of this. I would like Steve Arndt now to
15 begin the presentation.

16 MR. ARNDT: Thank you, sir. As John
17 mentioned, we are here to provide an overview of a
18 particular part of our research program. We briefed
19 the Subcommittee on Plant Operations on the digital
20 system reliability research program which is one of
21 several sub-programs that we have. As was mentioned,
22 this is an overview of that presentation.

23 At the actual subcommittee meeting, we
24 went into a fair amount, probably not as much as some
25 member wanted, but a fair amount of the technical

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1 details of that program. One of the comments that we
2 got back was, it was a little hard to follow how it
3 all got put together.

4 So in this presentation, I'm providing a
5 little bit more of the organization issues and how
6 they fit together and what the objectives are for the
7 full committee. If there are any specific technical
8 questions that you have, please feel free to ask
9 those. We'll try to provide you those answers if not
10 today then in the near future when you are putting
11 together your deliberations.

12 As per standard format, I'll give you
13 conclusions. I'll give you a very, very brief
14 overview of the rest of the research program plan so
15 you can understand how this part fits into the rest of
16 the program. I'll talk to you a little bit about the
17 drivers and boundary conditions, basically an
18 explanation of why we're doing what we're doing and
19 what the issues are.

20 One of which, of course, is the ongoing
21 movement in this area from the industry as highlighted
22 by the IEEE standard that was mentioned. Then I'll go
23 into the program, a little bit on the specific
24 research projects that make up the program, our
25 interfaces with other programs, and a short summary.

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1 With me here is my illustrious colleague, Hossein
2 Hamzehee who is part of the PRA Branch in Research.
3 They are working with us on certain aspects of this
4 program. Of course, that impacts their program and
5 the overall PRA program.

6 Conclusions we would like you to take away
7 from this presentation. First of all, the industry is
8 moving very proactively in this way both in the design
9 of advanced plants but also in the retrofitting of
10 digital systems and control room monitoring and
11 protection systems in current generation plants. We
12 have several applicants that have already told us they
13 are going to do complete control room retrofits with
14 digital systems including the safety systems, ESFAS
15 and RPS. This is an ongoing issue that will be with
16 us for the near future.

17 One of the parts of our Research
18 Instrumentation and Control Program is devoted
19 specifically to support regulatory review and
20 reliability in a risk-informed environment. That's
21 the part we're looking at specifically today. We have
22 several universities and national labs supplementing
23 in-house efforts to develop the tools, methods, and
24 regulatory guidance necessary to support these kinds
25 of regulatory reviews.

1 Short refresher. SECY-01-0155 was the
2 Digital Instrumentation and Control Research Plan.
3 That establishes the objectives and program areas that
4 we are working in. Since that time, about three years
5 ago now, there's been a lot of movement within the
6 organization.

7 We have added some additional areas
8 including future reactors, advanced reactor work.
9 We've added work in the cyber area. We've added areas
10 that have basically come up. Because of the changed
11 both in the external environment and the internal
12 environment, we're in the process of revising the
13 overall research program plan in I&C. That should be
14 available in the fourth quarter of this year. We will
15 come and talk with you in detail about that.

16 The research program goal in this area is
17 basically to get smart, understand how these things
18 work and how they fail and what the context of the
19 failures are, develop analytical tools to be able to
20 analyze those things both from a deterministic, how do
21 they fail, what do they fail, are the current rules
22 applicable, quantitative methodology applicable, do
23 this in a qualitative way, and also develop regulatory
24 guidance on how to best review the systems.

25 Our current regulatory guidance is very

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1 qualitative. It was written back in the mid to late
2 nineties. A lot of things have changed since then.
3 Industry as a whole has been able to develop a lot
4 more quantitative methodologies that we're going to
5 try and work into our regulatory structure including
6 risk-informed.

7 MEMBER ROSEN: Steve, I have a problem
8 with this goal because it doesn't say why you are
9 doing this. It doesn't say in order to make ourselves
10 feel better because we love knowledge or whatever your
11 reasons for doing this. It may be just typographical
12 or editorial. But at least you ought to say the goal.
13 I know you know why you are doing it. I think it's
14 because you are trying to support NRR.

15 MR. ARNDT: Right. We're trying to
16 support the regulatory mission of the agency which is
17 to ensure --

18 MEMBER SEIBER: Could you move a little
19 closer to the mic?

20 MR. ARNDT: I'm sorry.

21 MEMBER APOSTOLAKIS: In that context, I
22 think it would be helpful if you developed your own
23 integrated, decision-making process just like 1.174
24 does because NRR will have to make decisions in a
25 risk-informed way. So what kinds of decisions are

1 going to be faced by the regulators?

2 Is the process proposed in Regulatory
3 Guide 1.174 appropriate? Does it have to be modified?
4 I think if you started that way, then it would be
5 easier to justify why you are doing certain things.
6 And you are not doing them just for knowledge sake.

7 MR. ARNDT: And we will get to that
8 specific issue, what kind of guidance we're developing
9 and how that relates to current guidance later in the
10 presentation. But you are correct. We are doing it
11 specifically to support decision-making for this
12 particular technology in the current regulatory
13 environment.

14 MEMBER APOSTOLAKIS: But that I think will
15 give you an opportunity to investigate several aspects
16 of it at the high level that perhaps you haven't paid
17 much attention to. For example, there will be
18 significant testing of all of these things, debugging.
19 The process will be controlled. And then you want the
20 risk information.

21 The question is, how does one put
22 everything together? If there are holes in the risk
23 information, how do the other things take care of that
24 and visa versa? I think that would be a very useful
25 exercise for you that will be the overarching model.

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1 That will guide you also as to what research you need
2 to do. It may turn out the research you are doing
3 already fits very nicely. Or you may have to modify
4 it. Whatever. I think that would be a nice high
5 level framework.

6 MR. ARNDT: And in point of fact, maybe
7 not quite exactly in those words, but that's a process
8 that we're undertaking right now.

9 MEMBER APOSTOLAKIS: Okay.

10 MR. ARNDT: We're trying to put together
11 an integrated program plan on how all these things fit
12 together and what the outputs need to be to support
13 the regulatory structure. I have a little cartoon
14 here later in the presentation that kind of gets to
15 those kinds of issues. But if that doesn't answer the
16 itch you have, please bring it up again at the end
17 because we want to --

18 MEMBER POWERS: Maybe the subcommittee
19 members are more familiar with the issues here than I
20 am. But I guess I am perplexed.

21 MR. ARNDT: Okay.

22 MEMBER POWERS: My understanding is that
23 most of NRR's work, when it looks at digital I&C
24 systems, is controlled by an IEEE standard.

25 MEMBER SEIBER: Several.

1 MEMBER POWERS: Several of them.

2 MR. ARNDT: There is a whole structure of
3 IEEE standards and reg guides that support those.

4 MEMBER POWERS: And I will admit that in
5 my one attempt to try to understand those standards,
6 I discovered that that is a trail that I became
7 exhausted pursuing after a while because each standard
8 refers to another standard refers to another standard.

9 MR. ARNDT: Yes.

10 MEMBER POWERS: So what I'm struggling
11 with is, if you have this consensus standard available
12 to NRR and presumably some prescription on how to
13 follow that standard, what is it exactly that you are
14 providing them?

15 MR. ARNDT: What we're providing them or
16 attempting to provide them in some cases is an
17 understanding of the technical issues associated with
18 the particular technology that the standard or the reg
19 guide or the regulation is providing them a
20 methodology to assess. So for example --

21 MEMBER POWERS: So you are providing them
22 background information.

23 MR. ARNDT: We're providing them
24 background information, knowledge if you will. We're
25 providing them information and technical tools, if

1 they choose to use them, to independently assess the
2 technology via the review guidance, a check tool,
3 whatever.

4 MEMBER POWERS: And there you are saying
5 that they sometimes do things differently than what I
6 said.

7 MR. ARNDT: Well, there's a whole
8 structure associated in the standard review plan about
9 what is expected of a review. Of course, the
10 individual reviewer uses that as the guidance on how
11 to do that review. That, in large part, refers back
12 to --

13 MEMBER APOSTOLAKIS: But the IEEE
14 standards do not get into quantitative reliability
15 calculations.

16 MR. ARNDT: No, they do not. And point of
17 fact, our current regulatory position is that - and of
18 course this was developed in the mid nineties - the
19 knowledge was not and is not sufficiently mature to
20 use that as a primary review standard. This work is
21 to advance that state.

22 MEMBER APOSTOLAKIS: But is the position
23 of the staff that if something is in the standard it's
24 correct?

25 MR. ARNDT: No, the position of the staff

1 is that we will use consensus standards as the
2 starting place to develop regulatory positions if
3 appropriate. And then in some cases we choose to
4 endorse them.

5 MEMBER POWERS: Now, Professor Apostolakis
6 says you need this quantitative reliability
7 information. I'm wondering, do you?

8 MR. ARNDT: "Need" is a relative term.
9 The PRA policy statement says basically that you
10 should use risk-informed insights wherever supported
11 by technology, data, et cetera.

12 MEMBER POWERS: And here you could assert,
13 "Well, it's not supported so I'm not going to use it."

14 MR. ARNDT: Well, but the implicit
15 corollary there is, as the technology becomes
16 available, you should use it. That is in large part
17 where the research community and in some cases the
18 regulatory industry is going. The prime example that
19 I'll get to in a few minutes is the EPRI work that is
20 ongoing to risk-inform a particular piece of the I&C
21 review, that is, the defense-in-depth review.

22 MEMBER ROSEN: This Slide 4, could you
23 just go back to it for a minute now that your flow is
24 interrupted anyway? This first bullet is something
25 the nuclear industry has desperately wanted to do for

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1 a long time.

2 MR. ARNDT: That's correct.

3 MEMBER ROSEN: But it has been hampered
4 because the staff didn't have the tools and the
5 industry didn't have the tools to show itself or the
6 staff that these things were adequately reliable.

7 MR. ARNDT: That's correct.

8 MEMBER ROSEN: So it's a little bit of a
9 chicken-and-egg situation. We sat next to a chemical
10 plant down the road. Their control rooms were miles
11 ahead of ours, their instrumentation and control, and
12 it was cheaper and better in every way. And yet, we
13 couldn't use anything like they were using.

14 So we would have these longing gazes over
15 there and forget about it for a few months and then go
16 back and say, "Oh my God, it's even gotten better.
17 They are on version 2 of the thing. We just long for
18 version 1." So this is a chicken-and-egg situation.
19 I don't think your bullet is really correct. I mean,
20 "is moving forward." It would like to move forward.

21 It's moving forward on the fits and
22 starts. I know some things that have been done in the
23 balance of plant that are good. A couple of things
24 have been done on diesels that are excellent. So
25 that's the first safety-related thing. Can you give

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1 me a feel for where and more broadly it's being used
2 to retrofit digital systems and control monitoring and
3 protection systems? Boy, that's a pretty good
4 statement. That's a wish, not an is.

5 MR. ARNDT: That's a currently ongoing
6 process. There are at least four plants that I know
7 of - and my NRR colleagues could probably give me a
8 better set of numbers and plants that have basically
9 come and told us they are going to do full plant
10 control room retrofits including the protection
11 system, RPS.

12 MEMBER ROSEN: They are going to do it if
13 you'll approve it. Or are they going to do it on the
14 5059?

15 MR. ARNDT: No, protection systems we have
16 to review.

17 MEMBER ROSEN: That doesn't mean they are
18 going to do it. They are going to propose it.

19 MEMBER APOSTOLAKIS: The staff has already
20 approved I understand some digital.

21 MR. ARNDT: We have approved some digital
22 things. We also approved three generic platforms.

23 MEMBER APOSTOLAKIS: Platforms, yes.

24 MR. ARNDT: But that still requires
25 specific plant-specific reviews of how they are going

1 to implement those platforms or protection systems.

2 MEMBER APOSTOLAKIS: But let me go back to
3 what Dana said earlier. I think the implication in
4 the exchange was that there may be risk information
5 out there. The commission encourages us to use it.
6 Dana asked, "Do you really have to use it?" I don't
7 think it's a matter of choice here because if you
8 install these digital control systems in your safety
9 systems, the existing PRAs are not valid anymore.

10 MR. ARNDT: That's correct.

11 MEMBER APOSTOLAKIS: You don't know
12 whether the unavailability of a particular system is
13 the same as before. People talk about different
14 failure modes of digital software. All of the systems
15 are very nice. There are physical systems, continued
16 behavior. So it's adding another hole to the holes
17 that Commissioner McGaffigan mentioned earlier.

18 MEMBER ROSEN: And it's poking us --

19 MEMBER APOSTOLAKIS: So you really want to
20 understand that.

21 MEMBER ROSEN: It's poking us in the
22 weakness of our current technology and that is in
23 common cost failure.

24 MEMBER POWERS: It seems to me there's an
25 obvious solution to this. Go ahead and let them put

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1 in the digital control systems. Just have the analogs
2 as a back-up.

3 MEMBER APOSTOLAKIS: If we can find them.
4 Apparently you can't find them anymore.

5 MEMBER SEIBER: There's no room.

6 MEMBER APOSTOLAKIS: We don't manufacture
7 them anymore.

8 MEMBER ROSEN: Dana is suggesting, leave
9 the existing one and have this great big transfer
10 switch.

11 MEMBER SEIBER: No, the big motivation for
12 going digital --

13 MEMBER POWERS: What transfer switch?
14 Explain it to me. I want to know what you are talking
15 about. I didn't say anything about transfer switch.
16 I didn't mention transfer switch at all. What are you
17 talking about, sir?

18 MEMBER ROSEN: Well, you said leave the
19 analog as a back-up. What do you mean?

20 MEMBER POWERS: You have redundant control
21 systems.

22 MEMBER APOSTOLAKIS: Diverse, too.

23 MEMBER POWERS: And you would be diverse.

24 MEMBER APOSTOLAKIS: No, I think the
25 problem is you can't find them. From what I am told,

1 the chemical industry, for example, is not using them
2 anymore. They are not going to manufacture systems
3 just for the nuclear business.

4 MEMBER POWERS: Right.

5 MEMBER APOSTOLAKIS: That's a major
6 problem. Some of the things are market forces. Other
7 things are, the introduction of new system shakes our
8 confidence in the existing risk assessments. We
9 certainly have to understand what is going on.

10 MR. ARNDT: That's correct. There's a
11 number of different forces and reasons, if you will,
12 for undertaking this --

13 MEMBER APOSTOLAKIS: But I wouldn't call
14 these conclusions. This is probably summary.

15 MR. ARNDT: All right.

16 MEMBER APOSTOLAKIS: You don't conclude
17 that there is research at several universities. You
18 create it. You looked outside and said, "Gee, there
19 is work at Maryland," right?

20 MR. ARNDT: Yes.

21 MEMBER APOSTOLAKIS: So these are
22 summaries.

23 MEMBER SEIBER: Before you try to move
24 forward, I'm curious. As I understand what it is you
25 are trying to accomplish in these research programs,

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1 it seems to me that for the industry to develop
2 digital instrumentation they should have been doing
3 this work themselves. For example, in order to buy
4 the software, you ought to know something about the
5 software metrics, the engineering metrics upon which
6 you gage how good the software really is.

7 For example, in order to determine the
8 fault tolerance of a digital system, you ought to have
9 a fault injection technique. These have been around
10 for a long time. And so my question is, is the agency
11 duplicating something that's already out there or are
12 we doing this to find the regulatory nuances that
13 might be involved or has the work never been done?

14 MR. ARNDT: It's unfortunately a very
15 complicated matrix or patchwork of all of the
16 different issues you raised. Some of the work has
17 been done for very specific areas both in non-nuclear
18 and nuclear areas in various parts of the world, the
19 different regulatory structures.

20 The industry has, in various areas, both
21 in off-the-shelf technology as well as plant-specific
22 and industry-specific technology, done some of it.
23 But putting it into a specific regulatory context with
24 specific analysis tools as opposed to design tools is
25 something that has not been done.

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1 MEMBER SEIBER: Right. Okay.

2 MEMBER APOSTOLAKIS: But again, it's not
3 clear to me what role the fault injection method will
4 play in the decision-making process.

5 MR. ARNDT: Let me try --

6 MEMBER APOSTOLAKIS: No, I'm not asking
7 you to answer now. This is constructive advice.

8 MR. ARNDT: And later in the presentation,
9 we have an attempt to provide you with more
10 information on that.

11 MEMBER APOSTOLAKIS: But now let me come
12 back to another thing. I notice that your conclusions
13 today are not the same as the conclusions you
14 presented to us at the subcommittee meeting. At the
15 subcommittee meeting, you had a bullet that bothered
16 me then.

17 MR. HAMZEHEE: I took it out.

18 (Laughter.)

19 MEMBER POWERS: He's not stupid.

20 MEMBER APOSTOLAKIS: "Current analysis
21 methods are sufficiently mature such that guidance
22 documents can be developed." That was your first
23 conclusion on page 6 of the guide. Do you still
24 believe that?

25 MR. ARNDT: Yes, but it is a nuance of

1 something we were discussing specifically at the
2 subcommittee meeting which we're probably not going to
3 discuss in detail at this meeting which is why we took
4 it out.

5 MEMBER APOSTOLAKIS: Okay.

6 MR. ARNDT: For those people who are now
7 here and have now heard this, the issue was whether or
8 not we know enough to even write guidance.

9 MEMBER APOSTOLAKIS: But then you are
10 writing something that we haven't seen, Steve. Is
11 this guide out?

12 MR. ARNDT: No.

13 MEMBER APOSTOLAKIS: Where is it? How
14 come Mr. Seiber has a copy?

15 MEMBER SEIBER: Because I'm to make the
16 decision as to whether we're going to review it before
17 it goes out for public comment.

18 MEMBER POWERS: And he's particularly
19 astute and good looking. That's the reason he gets
20 it.

21 MEMBER SEIBER: Yes, I get stuff before
22 you do.

23 (Laughter.)

24 MEMBER POWERS: Routinely.

25 MEMBER RANSOM: Does your program address

1 optical transmission as well as wireless-type for the
2 transmission of signals as well as just the digital?

3 MR. ARNDT: The actual transmission media
4 as to fiber as opposed to copper.

5 MEMBER RANSOM: Right. Or wireless.

6 MR. ARNDT: Or wireless. Yes, we have a
7 program that's looking at that particular thing. It's
8 not something I'm going to discuss today. We do have
9 programs in that area. Let me scroll through the next
10 couple of slides, if I can.

11 MEMBER POWERS: Just to make sure you
12 don't go too rapidly.

13 MEMBER APOSTOLAKIS: Show every other
14 slide.

15 (Laughter.)

16 MEMBER POWERS: One of the problems with
17 Slide 6 is the term "continually improving" lacks a
18 quantitative character to it that smacks of a sandbox.
19 I don't know that you can say "improved by 50 percent"
20 or something like that. But you need to cast your
21 goals of your program into something that says, "Yes,
22 indeed, they will have accomplished something if they
23 did this."

24 MEMBER APOSTOLAKIS: I think, yes, the
25 Chairman and Commissioner Merrifield will not get too

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1 excited when they --

2 MEMBER POWERS: They might get very
3 excited is the problem.

4 MEMBER APOSTOLAKIS: But the wrong way.

5 MR. ARNDT: Here are some of the external
6 drivers that have basically been driving what we're
7 doing, why we're doing it, and how we're doing it.
8 Some of these things obviously you have seen before;
9 the National Academy study that ACRS actually
10 commissioned in this area and provided a whole list of
11 specific recommendations, many of which were
12 specifically in the digital system. As we get smarter
13 about this, put in the regulations, encourage the
14 licensees to do better.

15 As we mentioned earlier, the technology is
16 becoming available. The licensees are moving to do
17 this. It has the different failure modes. It's more
18 difficult to analyze. There have been several
19 workshops and industry-sponsored and DOE-sponsored
20 recommendations to move forward in this area. The
21 last one, of course, is the EPRI work to risk-informed
22 regulation in that particular area of defense-in-depth
23 and diversity.

24 VICE CHAIRMAN WALLIS: Can I ask my first
25 question now?

1 MR. ARNDT: Yes, sir.

2 VICE CHAIRMAN WALLIS: Would you clarify
3 something for me? I notice there's an NRR User Need
4 in 2000. There was the SECY in 2001. You are going
5 to talk about the digital I&C research program. I
6 would like - it doesn't seem to be part of your
7 presentation at all - some evidence that you have
8 achieved something in four years with this program.

9 All that you are talking about is a very
10 fluffy goal and a new plan. So what's been going on
11 for four years? Have you actually solved some
12 problems? Have you met these needs? And what are
13 these measures of success that you have achieved in
14 four years?

15 MR. ARNDT: Okay. We were planning on
16 including that in the presentation later this summer.

17 VICE CHAIRMAN WALLIS: Later this summer.
18 But it does exist.

19 MR. ARNDT: Yes.

20 VICE CHAIRMAN WALLIS: You have achieved
21 things in four years.

22 MR. ARNDT: Yes, we have indeed.

23 VICE CHAIRMAN WALLIS: And there are
24 definite measures of that achievement.

25 MR. ARNDT: Yes.

1 VICE CHAIRMAN WALLIS: They are not being
2 applied in the new plan though. There isn't a
3 statement, "We have achieved A, B, C, D, but we still
4 need to do E, F, G, H."

5 MR. ARNDT: Yes, there will actually be a
6 chapter in the new plan that basically says what we
7 have finished and what we haven't finished since the
8 last time.

9 VICE CHAIRMAN WALLIS: But you are not
10 going to tell us that today.

11 MR. ARNDT: I can give you a couple of
12 examples if you like.

13 VICE CHAIRMAN WALLIS: If you can fit it
14 in somewhere, yes.

15 MR. ARNDT: Okay. I will.

16 VICE CHAIRMAN WALLIS: Thank you.

17 MR. ARNDT: The overall research program
18 area has five general areas, systems aspects of
19 digital technology. These are basically things like
20 environmental effects, like EMI/RFI, large scale
21 things that effect the system as a whole such as
22 lightening and things like that.

23 As an example, we have published guidance
24 on environmental effects, EMI/RFI in the last couple
25 of years. Another area is software quality assurance

1 and software validation and verification. You will
2 remember just recently we came to you with a reg guide
3 in that area endorsing an IEEE guidance with some
4 exceptions based on our review of those issues.

5 VICE CHAIRMAN WALLIS: Does this lead to
6 some sort of regulatory enforcement in the way of
7 testing? They have to be reliable in the presence of
8 lightning. Is there some test that confirms that
9 they are indeed reliable in the presence of
10 lightning?

11 MR. ARNDT: Yes, when we put forth a
12 regulatory guide, we usually basically, either through
13 endorsement of a standard or through our actually
14 writing a particularly specific requirement.

15 VICE CHAIRMAN WALLIS: Very specific about
16 how you check that they meet the requirements.

17 MR. ARNDT: We have a set of requirements
18 that basically say, "If you do this, then it's
19 acceptable."

20 VICE CHAIRMAN WALLIS: Thank you.

21 MR. ARNDT: The digital system reliability
22 program, which we're going to talk about more later,
23 the emerging technology and applications program,
24 which is a program which is a set of projects to look
25 at new things that are coming so we're ahead of the

1 curve or at least not too far behind it on new
2 emerging issues, new technologies that are going to
3 work their way into the plants - the wireless
4 communication is one of these projects - the future
5 reactors program where we're actually looking at
6 specific applications that are likely to be used in
7 advance reactors, and what the technical issues are
8 going to be as well as potential policy issues like
9 the reliability.

10 MEMBER POWERS: This is a qualitative
11 question. Especially on these future reactors when
12 these guys come up the things, they surely know that
13 you are going to want to understand things about
14 reliability, quality assurance and stuff like that.
15 They must surely present stuff or have stuff for you.
16 Is that not at all useful to your line organizations?
17 I mean, how they did it, the line organization, just
18 take their techniques and use it.

19 MR. ARNDT: That's a more complicated
20 question than it might appear on first glance.
21 Because a lot of the future reactors were designed
22 someplace else, were designed for different
23 applications, CANDU and the ACR-700 being the primary
24 example, the CANDU 6s were licensed under a different
25 regulatory scheme and have different requirements.

1 One of the projects under the future
2 reactor program was basically to look at advanced
3 reactors or evolutionary reactors that have been
4 licensed elsewhere and try and learn what they did
5 both from a regulatory standpoint as well as from a
6 technical standpoint.

7 MEMBER POWERS: Are you looking at the
8 EPR?

9 MR. ARNDT: We're not looking at the EPR
10 right this minute. We're looking at the ACR-700 right
11 this minute. But if that gets, more likely down the
12 road --

13 MEMBER POWERS: More likely? It's sold.
14 They are going to build one.

15 MR. ARNDT: Yes.

16 MEMBER POWERS: You can't get more likely
17 than that.

18 MR. ARNDT: We're not.

19 MEMBER POWERS: But they clearly have an
20 all-digital control room.

21 MR. ARNDT: Yes, and we looked at the
22 Nforce (PH) reactors. We looked at ABWR. We looked
23 at the CANDU. We looked at a number of different
24 ones.

25 MEMBER POWERS: Well, I want to keep

1 hammering on the EPR. The Finns put together the most
2 comprehensive spec sheet I have ever seen in my life.
3 So they clearly speced the digital control system.

4 MR. ARNDT: Yes, they did.

5 MEMBER POWERS: Can we just borrow these
6 Finn guys? We're using them in Halden to run the
7 reactor. Can we just use them to review the digital
8 system?

9 MR. ARNDT: We can certainly learn from
10 what they are doing.

11 MEMBER APOSTOLAKIS: I thought they were
12 using the Siemens system.

13 MEMBER POWERS: George, to be honest with
14 you, I don't know what they are doing. But it
15 certainly wouldn't surprise you if they used the
16 Siemens system.

17 MEMBER APOSTOLAKIS: Which was reviewed I
18 think in Germany by various groups.

19 MR. ARNDT: TUV reviewed --

20 MEMBER APOSTOLAKIS: TUV reviews
21 everything there.

22 MR. ARNDT: As well as GRS/ISTec which is
23 their equivalent of research in this area. Actually
24 I work with the lead reviewer in that particular
25 organization very closely. It's a gentleman by the

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1 name of Arndt Lindner.

2 MEMBER APOSTOLAKIS: Which organization is
3 this?

4 MR. ARNDT: GRS/ISTec. It's the
5 subdivision of GRS.

6 MEMBER APOSTOLAKIS: In Munich?

7 MR. ARNDT: Yes, in Munich, that does this
8 particular area. They have done a lot of reviews as
9 well as actually developing review tools for that
10 particular product line which is basically a similar
11 product line that's going to go into some of our
12 retrofits. We have actually looked at some of their
13 review tools. We haven't specifically looked at the
14 EPR design, but we have looked at a lot of the stuff
15 that's going to go into it for other reasons.

16 MEMBER POWERS: I'm just wondering, theft
17 is far cheaper than invention.

18 MR. ARNDT: Yes, sir.

19 MEMBER POWERS: Can we steal instead of
20 invent?

21 MR. ARNDT: Yes, and part of the idea is
22 to use things as they become available which is why
23 we're involved.

24 MEMBER POWERS: And the reason to get
25 excited about the EPR is, unlike the ACR-700, unlike

1 the AP1000, unlike any of the Gen IV reactors, they
2 actually sold one. People might actually build one of
3 these.

4 MEMBER SEIBER: Moving on.

5 MR. ARNDT: Just a quick reminder of some
6 of the things that the NAS report recommended. We
7 should include influence of software failures in PRA,
8 the issue that George brought up earlier that as these
9 things become put into the plant, we need to update
10 our PRA to do it.

11 We need to develop advanced techniques to
12 analyze the digital systems, to increase our
13 confidence, and to produce uncertainty in our
14 quantitative assessments. Basically the committee
15 then as well as now is highlighting the fact that
16 there are things associated with technology that we
17 need to understand to do our job.

18 These next two slides are basically a
19 short summary of some of the issues we're trying to
20 deal with. We're trying to develop --

21 MEMBER APOSTOLAKIS: I think, Steve, here
22 a high level, risk-informed, decision-making process
23 will be helpful because then you will show why you
24 need to understand the failure mechanisms, why this,
25 why that.

1 MR. ARNDT: Right. And these are
2 basically just some of the issues that we have.

3 MEMBER APOSTOLAKIS: Now, you never really
4 presented to us the state of the data, did you? Have
5 you done this?

6 MEMBER POWERS: Can you even explain what
7 "state of the data" means?

8 (Laughter.)

9 MEMBER POWERS: Is this Indiana so that we
10 keep this data in?

11 MEMBER APOSTOLAKIS: State of the art,
12 state of the practice, state of the data.

13 MEMBER SEIBER: It's the state of the
14 union.

15 MR. ARNDT: As part of one of our review
16 projects, we looked at the state of the data. We're
17 not finished doing that.

18 MEMBER APOSTOLAKIS: Yes.

19 VICE CHAIRMAN WALLIS: What does it mean?

20 MEMBER POWERS: Yes, what does it mean?

21 MR. HAMZEHEE: I can expand on that a
22 little. We have done some review in search of the
23 existing data for the I&C electronic components.
24 There are some --

25 VICE CHAIRMAN WALLIS: Data describing

1 reliability?

2 MEMBER APOSTOLAKIS: Failure data.

3 MR. HAMZEHEE: Failure data, reliability
4 data, that's what it's talking about. These are the
5 information we need ultimately to be able to quantify
6 the reliability models.

7 VICE CHAIRMAN WALLIS: Put some number in
8 the PRA.

9 MEMBER APOSTOLAKIS: You never put a
10 number in.

11 VICE CHAIRMAN WALLIS: Well, you put
12 something quantitative in there, George, I hope.

13 MEMBER POWERS: They never put
14 distributions in, George.

15 MEMBER APOSTOLAKIS: They ought to.

16 MEMBER POWERS: They put numbers in.

17 MEMBER APOSTOLAKIS: And then they do
18 sensitivities.

19 MEMBER POWERS: Your point about doing
20 uncertainty analysis is falling on deaf ears. They
21 are never going to listen to you.

22 MR. HAMZEHEE: We're talking about a two-
23 stage process. One is, understand what constitutes a
24 model and then the data we need to support it so that
25 we can quantify the reliability or availability of a

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1 digital system. Then the second stage is, now, how do
2 we use this information to come up with overall risk
3 impact in the overall PRA models? This is really what
4 we're talking about.

5 MR. ARNDT: And the data is a fairly
6 complicated thing. It's both things like component
7 data, and how often does this particular processor
8 fail? It also has to do with what kind of failures
9 you are interested in. How does it fail in actual
10 use? What does the use profile look like?

11 VICE CHAIRMAN WALLIS: Component data
12 doesn't tell you too much because these things are all
13 hitched together in some way.

14 MR. ARNDT: That's correct.

15 MR. HAMZEHEE: And we have the preliminary
16 results of some of the work we have done with PNNL.
17 As a matter of fact, we have come up with some of the
18 insights of the review and literature search that we
19 have done. One of the major problems we have come up
20 with is the fact that it's hard to look at the CCF,
21 common cause failures, of software and hardware. Then
22 sometimes the existing data doesn't have enough
23 description to tell you really what part or component
24 is failing. And in some areas, there are some
25 recoveries that are embedded in data that you can't

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1 figure out exactly.

2 MEMBER APOSTOLAKIS: Are these data
3 nuclear or broader?

4 MR. HAMZEHEE: No, they are broader. I
5 think they are from other industries because in the
6 nuclear, you don't really have much data. That's a
7 problem we're facing right now.

8 MEMBER APOSTOLAKIS: But you have included
9 the - what is it - in Canada, the Bruce reactor.

10 MR. ARNDT: Yes, Bruce. And there's been
11 a very small number of nuclear-specific work. Another
12 part of our data program is looking at international
13 nuclear-specific failures. The problem with that is
14 it's almost certainly going to be a very sparse
15 database no matter how hard we work.

16 MEMBER APOSTOLAKIS: Sure.

17 MR. ARNDT: So it's probably going to help
18 us identify areas and trends and things like that and
19 bounding.

20 MEMBER APOSTOLAKIS: Now, "sparse" you
21 mean the nuclear.

22 MEMBER ROSEN: I'm not sure that matters.
23 The program doesn't know that it's working on a
24 nuclear application.

25 MR. HAMZEHEE: That's correct.

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1 MEMBER ROSEN: It's just software.

2 MR. HAMZEHEE: That's why we're looking at
3 some of the AT&T data that they have on some of the
4 electronics systems because they may be applicable.
5 You are right.

6 MR. ARNDT: The challenge from a nuclear-
7 specific domain is that the operational profile might
8 be different and how it's connected with other things
9 may be different.

10 MEMBER SEIBER: But it's the same basic
11 building blocks regardless of whether it's chemical,
12 retro-chemical, nuclear.

13 MR. ARNDT: That's correct.

14 MEMBER ROSEN: It's an actuated device and
15 a signal that comes.

16 MEMBER APOSTOLAKIS: The nuclear systems
17 may in fact be simpler. I mean, the control system of
18 the one of the Airbus. We don't intend to store
19 anything as complicated as that.

20 MEMBER SEIBER: It's the sheer numbers of
21 things that make nuclear different. In Airbus, you
22 only have so many actuating devices to move. But in
23 a nuclear plant, you might have 100 or 200 times that
24 many.

25 MEMBER APOSTOLAKIS: But -- Go ahead. I'm

1 sorry.

2 MR. ARNDT: But the system requirements
3 are frequently different like the single failure
4 criteria, the levels of redundancy, the levels of
5 diversity, the kind of error checking and things like
6 that, depending upon what level of failure data you
7 are talking about, whether you are talking about
8 component data or system data.

9 MEMBER APOSTOLAKIS: But there is a
10 fundamental question there. For example, in Future
11 Reactors, are they proposing to use digital systems
12 for control of the core or just monitoring and
13 actuation?

14 MR. ARNDT: It's a gambit depending upon
15 which system you are talking about.

16 MEMBER APOSTOLAKIS: Because that's a big
17 difference. The Airbus, it's actually a control
18 system.

19 MR. ARNDT: That's right.

20 MEMBER APOSTOLAKIS: Well, if we never
21 install any control systems that feedback control.

22 MEMBER SEIBER: But if you go digital I&C,
23 you are going to have digital control systems which
24 are primary sensors, controllers, and actuators and
25 you are going to have protection systems which shut

1 down. There should be independence between those two
2 systems. But you are going to be controlling with
3 digital I&C whether you want to or not.

4 MEMBER APOSTOLAKIS: But you are
5 controlling in the sense that you are shutting down.

6 MEMBER SEIBER: You're controlling
7 feedwater level. You're controlling heat level.
8 You're controlling pressurizer level.

9 MEMBER APOSTOLAKIS: These are minor
10 things.

11 MEMBER SEIBER: You are controlling
12 temperatures by modulating various things in the
13 plant. It's not on and off.

14 MEMBER APOSTOLAKIS: But is that what
15 Future Reactors propose? That was my question.

16 MR. ARNDT: Yes.

17 MEMBER APOSTOLAKIS: I'm not so sure.

18 MEMBER SEIBER: I don't know how else to
19 operate them other than with modulating controls on
20 many things.

21 MR. ARNDT: And depending upon the plant,
22 the pebble-bed reactor, for example, the current
23 proposed control system is very sophisticated
24 including --

25 MEMBER SEIBER: The pebble pushers on.

1 MR. ARNDT: The pebble pushers, the
2 control system, the protection system, the monitoring
3 system, the various interfaces with the grid. The
4 very extensive controls of the high temperature high
5 temperature helium turbine is all done by a fairly
6 sophisticated digital control system.

7 MEMBER APOSTOLAKIS: But now, another
8 question that comes from Slide 10 is - and I noticed
9 that also at the subcommittee meeting - your
10 presentation was very good. You used the right words
11 and the right goals, noble goals. And there was a
12 gap. Why are you doing the work at Maryland, for
13 example? It doesn't fit anywhere here. Do you see
14 that? Why are you doing the work at Virginia? That
15 was my problem. It was not clear to me.

16 MEMBER SEIBER: It does.

17 MR. ARNDT: At the risk of putting you
18 off, there's a slide in two or three slides that tries
19 to explain that.

20 MEMBER APOSTOLAKIS: Well, let's move on
21 then.

22 CHAIRMAN BONACA: Finally, one good
23 suggestion.

24 MR. ARNDT: This is basically a different
25 way of cutting the previous slide. I won't spend any

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1 time on it. It's basically how we model and what we
2 model and the kinds of issues.

3 MEMBER APOSTOLAKIS: Yes, and I think you
4 are missing a word there.

5 MR. ARNDT: I probably am.

6 MEMBER APOSTOLAKIS: But digital systems
7 and the reliability modeling period "Motherhood
8 Statements."

9 MR. ARNDT: Okay.

10 MEMBER APOSTOLAKIS: Come on, Steve.

11 MR. ARNDT: Fair enough.

12 MEMBER APOSTOLAKIS: Why didn't you put
13 another bullet, "We should do a good job"?

14 MEMBER SEIBER: There you go. That would
15 be our comment.

16 CHAIRMAN BONACA: That's important.

17 MEMBER SEIBER: Moving on.

18 MR. ARNDT: Moving on.

19 MEMBER APOSTOLAKIS: Moving on.

20 MR. ARNDT: These next couple of slides
21 are basically to try and answer the question that you
22 have been asking for the last couple of minutes.

23 MEMBER APOSTOLAKIS: I think you did a
24 disservice to yourself last time.

25 MR. ARNDT: Why is that?

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1 MEMBER APOSTOLAKIS: You should have
2 presented the integrated program.

3 MR. HAMZEHEE: We're working on it.

4 MR. ARNDT: We're trying to define it
5 better.

6 MEMBER APOSTOLAKIS: Yes, but we're here
7 to help not to criticize.

8 MR. ARNDT: Absolutely.

9 MR. HAMZEHEE: We have made progress.

10 MEMBER APOSTOLAKIS: Good.

11 MR. ARNDT: The program basically consists
12 of three elements. If you think of it in these areas,
13 it's easier to see how it fits and what we're trying
14 to accomplish in the individual programs. The first
15 area is basically to develop quantitative, digital
16 system models of the systems, understand how they
17 work, and how you can model them in different ways.
18 That's basically the Virginia work, the Maryland work,
19 some of the work at Halden and things like that.
20 We're trying to understand how the systems work
21 primarily.

22 MEMBER APOSTOLAKIS: I would approach this
23 in a different way. I would first complete the data
24 analysis investigation that you are doing and draw
25 some conclusions from what you all see there as you

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1 have already started doing. Then in parallel, I would
2 focus on the assumptions behind all of these models
3 that you are mentioning here.

4 Then when you have the insights from the
5 data, I would try to match the models and the insights
6 and then conclude that maybe under these conditions,
7 this model seems to be pretty good and under other
8 conditions, some other model is pretty good. I think
9 sometimes people take models just because they are out
10 there, especially some sort of an international
11 document.

12 This International Electrotechnical
13 Commission, for example, that has Markov models in
14 there, does that commission ever have a peer review by
15 somebody who can be adversarial? I don't know that.
16 But the damage they do is, Markov, Markov, Markov,
17 we'll all do Markov. It's a mystery to me that Markov
18 models apply to all of this.

19 MR. ARNDT: And one of the big challenges
20 - and I actually sit on an IEC standards review.

21 MEMBER APOSTOLAKIS: I'm sorry.

22 MR. ARNDT: That's okay. Like most
23 standards review bodies, IEEE, IEC, ASME, they
24 generate their documents by basically an internal
25 review, if you will, not an external review. But the

1 real issue is, we're trying to accomplish several
2 things in this program. One of which is exactly what
3 you said, understand what is necessary, what the
4 issues are, what does the data tell us, what do models
5 tell us, in parallel with trying to understand what
6 the guidance are, what the limitations are and things
7 like that.

8 MEMBER APOSTOLAKIS: Last time, for
9 example, we had the presentation from Virginia. And
10 then somewhere there it says, "If we have a Markov
11 model, we have lambda and this and that and here is
12 the result." I think a committee like this would like
13 to see before the equations, what does lambda
14 represent? What kind of events are you talking about?
15 This lambda, what is it? Rather than starting with it
16 and then developing equations. This is the
17 fundamental question here.

18 I'm not saying I have the answer myself,
19 but if you read the literature, as you know, there are
20 two conflicting approaches. One is that these are
21 design specification requirement errors. You can't
22 really model them just as you can't model hardware
23 designers. The other point of view is, "Yes, but
24 things happen in time and this and that." These are
25 fundamental issues that I think we should resolve

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1 first.

2 MR. ARNDT: Yes, and the real issue is,
3 you have to look at this in two parallel paths.
4 There's the issue of understanding how the system
5 works and how it fails and what the failure modes are
6 and things like that which is really what the first
7 part of the program is which is what Barry is doing
8 with his fault injection methodologies, Professor
9 Johnson at UVA, what Carol is doing in software
10 metrics work, and what we're doing with the
11 requirements analysis work at Halden. The point of
12 that work is to understand how you can model these
13 systems because if you don't understand how they fail,
14 what the failure modes are, in essence, what lambda
15 presentation is.

16 MEMBER APOSTOLAKIS: But is that what
17 Virginia is producing? I would have no problem with
18 that. They go way beyond that. They give me a study
19 state probability that comes from a Markov model and
20 I cringe.

21 MR. ARNDT: Yes, the fundamental issues --
22 (Laughter.)

23 CHAIRMAN BONACA: Could don't we proceed
24 with the presentation? I am losing sight because
25 there's a side discussion going on.

1 MR. ARNDT: Yes, I apologize, sir.

2 CHAIRMAN BONACA: No, it's not your fault.

3 MEMBER APOSTOLAKIS: It's not mine either.

4 If two guys are talking and --

5 CHAIRMAN BONACA: I'm trying to think
6 about his presentation and I'm stuck here.

7 VICE CHAIRMAN WALLIS: Yes, I'm trying to
8 think about it too. The problem I have with it all,
9 to go back to my previous question, is all of these
10 slides talk about developing something as if nothing
11 exists. Is there any state of the art at all? And
12 what are the faults of the state of the art? You
13 haven't given us any kind of a base to say what you
14 are building on. The impression I get is that it's
15 all new.

16 MEMBER APOSTOLAKIS: You're asking my
17 question in different words.

18 VICE CHAIRMAN WALLIS: Okay.

19 MEMBER APOSTOLAKIS: What I asked him to
20 do is look at the existing models and question their
21 assumptions.

22 VICE CHAIRMAN WALLIS: Okay. Well, tell
23 us. Is it all new?

24 MR. ARNDT: There have been a number of
25 different areas that people have investigated. It

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1 primarily depends on what industry and what particular
2 interest area you are coming from. For example, the
3 fault tolerant people, these are the people who design
4 systems not to fail, design systems in such a way that
5 they have what is referred to as fault tolerance.

6 MEMBER SEIBER: Self-recovery.

7 MR. ARNDT: They continue to work either
8 because of redundancy or because of fixing and things
9 like that. They have developed certain methodologies
10 to do that. One of the projects we have is to build
11 on that particular methodology to try and develop
12 tools for our particular applications. There is a
13 whole set of people who look at software independently
14 of hardware.

15 There's a large argument associated with
16 whether or not that's appropriate or not. One of the
17 projects that we have is to look at a particular part
18 of that area to see whether or not you can use those
19 kinds of methodologies, be it software fault tree
20 analysis or software metrics predictions or things
21 like that. They have been looking at a particular
22 area of it to see whether or not we can use that.

23 VICE CHAIRMAN WALLIS: So computers have
24 been around for a long time and digital systems for a
25 long time. There's no state of the art. I can't go

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1 to some university 50 miles from the coast where all
2 the good ones are, of course, and take a course where
3 they say, "This is the way you do it. This is the
4 failure."

5 MEMBER APOSTOLAKIS: They don't even teach
6 courses on failures of systems. If you go to a
7 computer science department and talk about failure,
8 they look at you like you are from Mars.

9 VICE CHAIRMAN WALLIS: It's incredible,
10 isn't it?

11 MEMBER APOSTOLAKIS: They don't teach that
12 because they think in terms of mass production.

13 MR. ARNDT: Quite frankly, the people who
14 really think about this at a serious level you could
15 probably fit in this room worldwide. It's very small.

16 MEMBER APOSTOLAKIS: Very small.

17 MEMBER SEIBER: It's a matter of
18 consequences. You talk about digital control of an
19 airplane. If the airplane never levels out as it's
20 landing, you feel sorry for 200 to 300 people. On the
21 other hand, the consequences of a nuclear accident,
22 while highly improbable and probably doesn't hurt
23 anybody, everybody is scared of it.

24 So that demands this greater level of
25 attention to all these aspects of digital I&C. And

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1 this is a relatively new art. I would like to
2 encourage us to move on because we actually have to
3 stop at 5:30 p.m. for this session. To argue a single
4 point and miss the rest of the talk is probably not
5 good.

6 MR. ARNDT: The second part of the program
7 is basically the issues specifically associated with
8 risk-informed regulation. How do you take the
9 knowledge and the models that you develop and put that
10 into a system analyzing risk-informed? Integration
11 with current generation PRA, how do you do it? The
12 last part is the establishment of regulatory guidance
13 and understanding what is and is not acceptable and
14 how do you fit that into our current procedure.

15 The next three slides just amplify on
16 that. I'll go through them very quickly. The real
17 issue is to attack some of the fundamental issues in
18 the first part, the issue of hardware versus software,
19 the limitations to the models, what kind of modeling
20 is meaningful, what level of assurance you can have,
21 how does the testing affect things, the basic
22 software/hardware digital system aspects of these
23 kinds of issues.

24 The second part deals with what's an
25 appropriate way to model these in a risk-informed

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1 application? Can you use traditional PRA models and
2 just put data in at the lowest level of reliability?
3 You would need actual dynamic system modeling at the
4 lowest level.

5 VICE CHAIRMAN WALLIS: Most areas of
6 engineering developing models from scratch, verifying
7 them, testing them, showing that they work, trying
8 them in the field, takes a very long time.

9 MR. ARNDT: It is.

10 VICE CHAIRMAN WALLIS: Is that the same
11 thing with this system?

12 MR. ARNDT: Yes.

13 VICE CHAIRMAN WALLIS: Is it going to take
14 you ten years or something like that?

15 MR. ARNDT: We're stealing from everything
16 we possibly can. We're looking at things from the
17 aviation community. We're looking at things from the
18 transportation community. We're looking at things
19 that have been done in other parts of the world and
20 trying to fit them into our methodology and see if
21 they work which is one of the reasons we're trying to
22 -- When I say "new models and methods," new for us and
23 pilot them and see whether or not they work.

24 MEMBER SEIBER: You are piloting them on
25 relatively simple systems like the cardreader and the

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1 three-element feedwater control.

2 MR. ARNDT: Depending on the particular
3 project, we're trying to start a relatively simple
4 system to see whether or not it's feasible.

5 MEMBER SEIBER: Right.

6 MR. ARNDT: And then we're going to use a
7 prototypical nuclear system.

8 MEMBER SEIBER: Right.

9 MR. ARNDT: And then the last one is
10 basically looking at the regulatory things.

11 MEMBER APOSTOLAKIS: You know, just one
12 quick comment here. You may be going down the path of
13 the human reliability analysts in the sense that these
14 people who develop all these models typically don't
15 read each other's work. Maybe you can think of a way
16 to force them to do that, at least the guys you
17 control.

18 MR. ARNDT: Yes, and that is a significant
19 issue that we have experienced and have been fighting
20 and working with because of exactly that. The
21 electrical engineers who do this work publish in the
22 IEEE journals. The reliability engineers publish in
23 journals like yours. The human factors people publish
24 in the human factors. The people who are nuclear
25 engineers publish in *Nuclear Technology*. It's a real

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1 challenge to cross-fertilize this work because not
2 only do they frequently publish in different journals
3 but they also speak slightly differently.

4 MEMBER APOSTOLAKIS: Absolutely.

5 MR. ARNDT: That's one of the reasons that
6 we're trying to integrate this as much as we can and
7 get the right people with the right resources looking
8 at the program.

9 MEMBER SEIBER: Okay. Moving on.

10 MR. ARNDT: Implementation, we basically
11 have the programs proceeding in parallel as much as
12 possible. Obviously some things need input from
13 others. As I mentioned earlier, the first part is
14 being carried out by Virginia, Maryland, and Halden
15 with some work from in-house staff. The second part
16 is being carried out by BNL, Ohio State, and in-house
17 efforts.

18 MEMBER APOSTOLAKIS: Who in Ohio State?

19 MR. ARNDT: Tunc Aldemir and Don Miller.

20 MEMBER APOSTOLAKIS: And Don Miller.

21 MR. ARNDT: Yes, the third part is being
22 carried out primarily through in-house efforts with
23 some support from BNL?

24 VICE CHAIRMAN WALLIS: How will you
25 evaluate the results of this work?

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1 MR. ARNDT: Primarily through pilot
2 studies, look at a real system and see whether or not
3 we can coddle it in such a way that the information --

4 VICE CHAIRMAN WALLIS: How do you know
5 that it's not a fantasy, this model, when you do this?
6 What's the check that it's good?

7 MR. ARNDT: There are several ways of
8 assessing whether or not the reliability number or the
9 model we're getting is what we expect to get. You can
10 have independent reviewers. You can have peer review
11 which we have done in several cases. You can have
12 basically an Oracle, if you will.

13 VICE CHAIRMAN WALLIS: That's going to
14 work well enough?

15 MR. ARNDT: It depends on what kind of
16 numbers we're expecting.

17 VICE CHAIRMAN WALLIS: The reliability
18 bridge-building took centuries to establish. There
19 were models and they developed. But they had to be
20 tested and checked and so on.

21 MEMBER POWERS: And they failed
22 frequently.

23 VICE CHAIRMAN WALLIS: They failed
24 frequently. And computer systems fail from time to
25 time in a catastrophic way. No one seems to know why.

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1 I see there might be a problem here.

2 MR. ARNDT: I think we're getting better
3 at knowing why. But you are correct. In a lot of
4 ways, you can go back to Professor Levenson who --

5 VICE CHAIRMAN WALLIS: How do you avoid
6 being fooled by these academics developing all these
7 models and saying they are great?

8 MR. HAMZEHEE: I think just one thing at
9 least we will try to do is that the fact that we don't
10 do what the rest of the industry does and that is to
11 look at the system failure. We're trying to go down
12 at the lower level to really try to understand at
13 least what could go wrong at the lower level.
14 Hopefully that will help us in understanding how
15 things can fail and how they constitute a system
16 failure and with some uncertainty.

17 MR. ARNDT: And one of the things that I
18 have in an earlier slide that I went through more
19 quickly is, one of the issues is, if they models don't
20 at least prescribe to the limited data that we have,
21 you know you have a problem. In some cases, the data
22 is going to directly inform the models and provide us
23 reliability numbers.

24 But in most cases, it's going to be there
25 just to be sure our modeling is not completely out to

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1 lunch. That it's failing in the same way the data
2 gives us general ideas associated with it. It's not
3 failing any more than what the data would give us and
4 things like that.

5 MEMBER POWERS: Steve, you know the models
6 of physics frequently are highly, highly approximate.

7 MR. ARNDT: Yes.

8 MEMBER POWERS: And don't match the data.

9 MR. ARNDT: Right.

10 MEMBER POWERS: Is there a chance sometime
11 in the near future you could take a model, something,
12 and run it through an analysis and say, "Okay. Here's
13 what you get at this highly simplified model. But
14 here's what we actually want"?

15 MR. ARNDT: Well, I go back to the old
16 physicist statement, "All models are wrong. Some are
17 just useful." One of the things we're trying to do in
18 our pilot studies is kind of that kind of thing. It's
19 run it through the analysis, see what the numbers are
20 getting, and understand whether or not that's
21 sufficiently accurate in an abstract way and has
22 enough detail to be useful from a regulatory
23 standpoint.

24 MEMBER POWERS: It could easily be if your
25 failure rates are so low that I don't care if your

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1 model is off by a factor of 10 or 100.

2 MR. ARNDT: That is one of the issues.
3 That's actually a two-edged sword in several different
4 ways. One of the issues that we look at is, what
5 we're trying to demonstrate is that it's at least so-
6 and-so accurate. If it's more accurate than that, we
7 don't care.

8 If the model tells us it's ten to the
9 minus eight and we have relative confidence that it's
10 not to bad a model, then it's more than good enough at
11 ten to the minus six. That is certainly one part of
12 the guidance-type issue that we're looking at, the
13 quality of the model, the confidence we have in the
14 model, and things like that.

15 The problem with that is that many of the
16 things that drive the uncertainty and the number are
17 things that make that kind of analysis very difficult.
18 Simplified analysis in this area gives us real
19 problems because you have system interactions which is
20 a very significant problem. You have common mode
21 failure not only of the software but of the hardware
22 and the software/hardware interfaces and the
23 communications and other things. You have issues
24 associated with model incompleteness which is a real
25 problem in this area. So it's very difficult, but

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1 yes, that is something we're looking at.

2 MEMBER POWERS: I think I could have taken
3 human factors and substituted in your speech there and
4 everything would have been coherent. I don't think
5 there was anything that you said that could not be
6 said about human factors. Yet, we get an awful lot of
7 mileage over what Dowell (PH) and Swain put together,
8 which everybody will admit doesn't match the data. It
9 simply happens to be useful.

10 MR. ARNDT: Yes, and our state right now
11 is trying to get to that point.

12 MEMBER POWERS: Okay.

13 MR. ARNDT: To get a model or set of
14 models that are useful that may not be 100 percent
15 accurate, that may not be completely reflective of the
16 data, et cetera, but are useful for our particular
17 application.

18 MEMBER POWERS: The reason Alan was
19 successful is, having been told what he was doing was
20 impossible - and he did it for the nuclear weapons
21 program is what he was doing it for - is he started
22 discarding requirements. People say this interacts
23 with this and you have to worry about this. He
24 truncated down to something that was doable first and
25 then quit.

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1 (Laughter.)

2 MEMBER POWERS: And people have been
3 fighting all over the rest of the stuff ever since.
4 Is there a point where you can make that bold
5 initiative? Or you are not there yet.

6 MR. ARNDT: Well, that really goes back to
7 the discussion we had at the very beginning about, are
8 we sufficiently mature that we can make a model that's
9 useful? Whether or not it's accurate or not is a
10 different issue. I think we are to the point where we
11 can do that.

12 MEMBER POWERS: Okay.

13 MR. ARNDT: The few pilot studies we have
14 had have been relatively successful. They have had
15 issues and limitations and things like that. The
16 current research that we have ongoing are for larger
17 systems that are more prototypical of bigger (PH)
18 applications both in the complexity and the size and
19 things like that. So I think we are at that point.
20 As was mentioned earlier, there is some work we can
21 build on, not a lot. But we're trying to get to that
22 point where we have that.

23 MEMBER POWERS: In thinking about
24 presenting your material here and to others less
25 sympathetic, you might want to communicate that more

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1 optimistic state of affairs and whatnot because you
2 have succeeded in convincing me this is a very, very
3 difficult area to work in and I'm glad I don't. But
4 you might want to also communicate that those of you
5 who are condemned to work in this field are actually
6 verging on the cliff of a success here.

7 MEMBER ROSEN: Success in the sense that
8 maybe you'll have something useful. You won't be able
9 to prove it's giving you the right answers. But
10 you'll at least have something that one can use to
11 give you an answer.

12 MR. ARNDT: Yes.

13 VICE CHAIRMAN WALLIS: It would help me
14 greatly if you could show an example of a success and
15 a measure of it and a test which showed why it was a
16 success.

17 MEMBER APOSTOLAKIS: One measure of
18 success is to have a model that guides you to
19 investigate a piece of software and you find an error
20 that others have not found.

21 MR. ARNDT: Right.

22 MEMBER POWERS: That's a very, very
23 demanding level of measuring.

24 MEMBER APOSTOLAKIS: But that's what
25 people are looking for.

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1 MEMBER POWERS: That strikes me as very
2 useful in academic surroundings. But I think that's
3 a very demanding level of metric for this.

4 MEMBER APOSTOLAKIS: No, because the
5 tests, Dana, are blackbox tests essentially. Here you
6 are trying to have some intelligent approach that will
7 allow you to combine blackbox tests with some
8 intelligent analysis of the system. You would never
9 rely on one method. You asked for a measure of
10 success. Here is a measure of success. It may be
11 difficult to achieve. But it's a measure of success.

12 MEMBER SEIBER: Well, the problem is you
13 never know when you achieve it because in a complex
14 system, you are going to have more than one fault.

15 MEMBER APOSTOLAKIS: The difficulty is
16 separate from the measure. He asked for a measure of
17 success. I gave him one.

18 MEMBER POWERS: And we don't deny it. But
19 that's far too demanding for what they are trying to
20 do.

21 MEMBER APOSTOLAKIS: Yes, and I'm not
22 saying that we'll use that measure to evaluate their
23 approach. I'll tell you. Professor Levenson that
24 Steve mentioned, that's how she made her reputation.
25 She did the fault tree analysis with one of her

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1 Master's students in 1985 on a small control system of
2 a satellite that Berkeley is supposed to launch. Lo
3 and behold, the fault tree led her to find an error.
4 And everybody paid attention immediately.

5 MR. ARNDT: And although it is a very
6 difficult metric to achieve simply because there are
7 two different ways of looking at it, if you find
8 something, great, you prevented a fault.

9 MEMBER APOSTOLAKIS: If you don't find it,
10 you don't know.

11 MR. ARNDT: If you don't do it --

12 MEMBER APOSTOLAKIS: It was really good.

13 MR. ARNDT: Did you really demonstrate
14 that there weren't any faults? That's right.

15 MEMBER ROSEN: Absence of evidence is not
16 --

17 MEMBER SEIBER: Why don't I suggest that
18 we speed up since we only have 20 minutes left and a
19 lot of slides?

20 MR. ARNDT: Okay. One quick point before
21 we leave this point. One of our researchers who has
22 done extensive work in this area in the transportation
23 business has actually made his name by using the
24 methodology we're currently using to find faults in
25 some metrices (PH) systems. So the techniques are

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1 capable of doing that. We simply haven't exercised
2 them for a nuclear-specific application yet. That's
3 currently part of our research program.

4 MEMBER SEIBER: Okay.

5 MR. ARNDT: This is basically just a
6 cartoon of how the various pieces fit together. I'll
7 spend two seconds on this. This area up here --

8 MEMBER APOSTOLAKIS: Do you have a
9 microphone on you?

10 MR. ARNDT: No, I'm sorry. The circle in
11 the upper left hand side is basically the quantitative
12 description. What we're trying to accomplish is
13 understand how the systems fail, what the failure
14 modes are, how likely they are to fail, those kinds of
15 systems analysis kinds of things both for software and
16 an integrated hardware/software system.

17 That in and of itself is a useful output.
18 As you can see in the arrow going up, that is
19 informing our other parts of our research program
20 that's trying to improve the review of these systems
21 in a deterministic way. But it also provides us
22 understanding what the limits and strengths of the
23 system modeling is and also hopefully some model
24 failure rates and things like that that can be put
25 into the PRAs. That's the Virginia work. That's the

1 Maryland work, looking at specific ways things fail.

2 The box on the right there is digital
3 systems, PRAs, failure rates, how you integrate with
4 current generation PRAs, whether or not dynamic fault
5 trees or Markov or some other methodology is the most
6 appropriate way of doing it. That also provides us
7 input on the guidance that establishes the capability
8 of the models, the importance of the assumptions, the
9 kinds of uncertainties you have to deal with.

10 Then of course, the bottom bullet is the
11 establishment of the guidance. What are we going to
12 do? It's the stuff that George was talking about in
13 the beginning of the presentation. Do we need a 174-
14 series document in this area? How does this affect
15 the PRA quality documents? How do we update the
16 standard review plan to be more risk-informed in this
17 area so that that is the output of that particular
18 part of the work?

19 MEMBER APOSTOLAKIS: Now again, Steve,
20 this is not just the area where that is important.

21 MR. ARNDT: Correct.

22 MEMBER APOSTOLAKIS: When we do 1174
23 applications in other areas and somebody tells me that
24 they have installed digital systems, I'm going to have
25 a problem. You all remember what McGaffigan said

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1 today about the holes and where is the absolute CDF.
2 Now, you are creating a hole because I don't know, as
3 you have on your next slide, what the failure modes
4 are. You are telling me that they are different. And
5 I believe you because you are right. So it's not just
6 here. What you are doing here will affect many other
7 things.

8 MR. ARNDT: Right.

9 MEMBER ROSEN: As an overall systems
10 diagram, I think this would be stronger if you showed
11 some of these arrows as two way streets.

12 VICE CHAIRMAN WALLIS: I think it would be
13 very good if you could show us that these systems
14 really are more reliable than all these analog systems
15 we've been relying on. I would believe it.

16 MR. ARNDT: That's true.

17 MEMBER APOSTOLAKIS: I don't think they
18 are more reliable.

19 MEMBER SEIBER: You can't do that.

20 MEMBER APOSTOLAKIS: They are not more
21 reliable.

22 MEMBER SEIBER: The major failures are in
23 the actuators and the sensors.

24 VICE CHAIRMAN WALLIS: Not persuasive.

25 MEMBER SEIBER: And not in the control

1 room which is his digital part.

2 MR. ARNDT: The next slide is basically a
3 chart form of what you saw before. It's basically
4 talking about what the specific issues are, what the
5 approach is, and what the resources are associated
6 with that. Very briefly, some of the successes we
7 have had so far are that we have done some very
8 simplified modeling in some of these areas.

9 For example, the Maryland project, we did
10 a simplified software system. It was a data entry
11 access system and had some successes in that area. We
12 did a fairly simplified feedwater control system for
13 the University of Virginia and had some successes in
14 that area. Both those programs are going on to a
15 phase two pilot program, real actual digital systems
16 that are going to be used for protection systems.

17 We have made some progresses, as was
18 mentioned earlier, in understanding what the state of
19 the data is. We're trying to do some more work in
20 that area. The next three or four slides just update
21 the specific research projects. I'll go through those
22 fairly quickly.

23 MEMBER APOSTOLAKIS: Now, this is where I
24 have an objection or at least I don't have enough
25 information. Why did you pick those? Have you done

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1 a literature review where you evaluated assumptions?
2 For example, you are about to start the dynamic
3 reliability modeling at Ohio State. I'm not saying
4 it's not a worthwhile model, but I don't know how it
5 fits in the bigger picture.

6 In the ensemble of models, what can it do?
7 Why is it better than something else? That's what's
8 missing. The conclusions may still be the same. You
9 may still decide to do this. But at least I need to
10 be convinced. The rest of the committee may not. Do
11 you see what I mean?

12 MR. ARNDT: Yes.

13 MEMBER APOSTOLAKIS: In other words, the
14 data evaluation that you are already doing and the
15 evaluation of the models and the comparison of the two
16 in my view are the number one tasks that will define
17 everything else. Maybe Tunc can do it. I don't know.
18 Not this model, I mean the evaluation.

19 MR. ARNDT: Right.

20 MEMBER APOSTOLAKIS: The problem is that
21 all these guys are my friends.

22 MEMBER SEIBER: That's probably right.

23 MEMBER POWERS: Not for very long.

24 (Laughter.)

25 MEMBER POWERS: This may be a self-

1 correcting problem here.

2 MEMBER RANSOM: We visited Japan 15 years
3 ago. They were working on the all-digital control
4 room and system at that time. I'm wondering, where
5 are they at this point 15 years later?

6 MR. ARNDT: Actually, the Japanese as well
7 as the Koreans with the ABWR work are working in this
8 area. Actually the head of the Korean program, J.
9 Juha, was a classmate of mine. They are doing much
10 more qualitative analysis of this work. Basically
11 their work is primarily in the area of bounding
12 analysis.

13 How good does the system have to be, not
14 necessarily how good can we demonstrate it to be which
15 is a different way of attacking this. We looked at
16 that and we decided that we didn't want to it that
17 way. I think primarily because of the way our
18 regulatory structure is set up, not so much that it's
19 not a good way of doing it.

20 MEMBER APOSTOLAKIS: Does 80+ have a
21 digital control system yet?

22 MR. ARNDT: 80+?

23 MEMBER APOSTOLAKIS: Yes, the Combustion
24 Engineering. I think they do.

25 MR. ARNDT: They do but it's not nearly as

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1 sophisticated as some of the others.

2 MEMBER APOSTOLAKIS: I see. But they did
3 have somebody review it, didn't they?

4 MR. ARNDT: Yes. ABWR, for example, is a
5 much more sophisticated system.

6 MEMBER SEIBER: Well, we have 15 minutes
7 left and seven slides.

8 MR. ARNDT: Okay.

9 VICE CHAIRMAN WALLIS: I guess I have to
10 say, I like academics and I like academic thought.
11 But it's very different to do projects in academia
12 which result in publications in journals and prestige
13 and designing a workable, adequate system to be used
14 by NRC or industry. It's a very different task. I
15 wonder if you have the right people doing it.

16 MR. ARNDT: It is a challenge. Getting
17 the right set of people doing the right set of things
18 is a very difficult thing. The concern is developing
19 a prototypical application is a challenge at the
20 universities. But primarily those are the people who
21 are doing the research.

22 VICE CHAIRMAN WALLIS: Good luck.

23 MR. ARNDT: Okay.

24 MEMBER APOSTOLAKIS: So now that you
25 retire, universities are not good.

1 VICE CHAIRMAN WALLIS: No, they are
2 wonderful for what they do well.

3 MEMBER APOSTOLAKIS: Which is a tautology.
4 They are wonderful for what they do.

5 (Laughter.)

6 MR. ARNDT: I'm going to step through
7 these very quickly. The University of Virginia work,
8 as I think we have talked about, is dedicated to using
9 the methodologies that have worked in certain other
10 areas to develop a methodology in our area
11 fundamentally based on the fault injection technique.

12 VICE CHAIRMAN WALLIS: But you see what I
13 mean. A modeling project is very different from
14 developing a usable system to do something.

15 MR. ARNDT: Yes, that's right.

16 MEMBER SEIBER: Moving on.

17 MR. ARNDT: The University of Virginia
18 work is focused on basically the software aspect in
19 isolation which is one of the methodologies that is
20 done. This particular project is looking at software
21 metrics which is one of the particular issues. But
22 they are also providing input on software reliability
23 and software in general. The Brookhaven program is
24 looking at the classical PRA issues, the regulatory
25 guidance, the failure databases, the traditional PRA

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1 modeling, failure modes and effects analysis, failure
2 modes, effects, and criticality analysis.

3 MEMBER APOSTOLAKIS: When do you think you
4 will be ready to have Brookhaven here in the
5 subcommittee meeting? Remember, we're here to help.

6 MR. ARNDT: We could probably have them
7 here relatively soon.

8 MEMBER APOSTOLAKIS: In the fall sometime?

9 MR. ARNDT: Yes, probably.

10 MEMBER APOSTOLAKIS: Because I'm really
11 interested in this.

12 MR. ARNDT: Okay. I'd like to work with
13 the subcommittee to figure out what the best set of
14 presentations are.

15 MEMBER APOSTOLAKIS: That will be great.

16 MR. ARNDT: Like I mentioned, Ohio State
17 is looking at the dynamic reliability model and the
18 issues associated with that. Some smaller projects.
19 The Halden is there. We pay into it. They are doing
20 various work. The big thing that they do that other
21 people don't do is the digital system requirement-type
22 work.

23 The COMPSIS is the international failure
24 database in the nuclear community. We're a
25 participant in that. Then we have our own in-house

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1 staff efforts. As I mentioned earlier and has been
2 pointed out, a lot of other people are doing it, both
3 external organizations and there's a lot of interfaces
4 associated with internal regulatory policy. We're
5 working with the NRR electrical and I&C people as well
6 as the PRA community over there, our colleagues in the
7 Research PRA community.

8 There's other nuclear research
9 organizations that are working in this area. EPRI and
10 their work is the primary one right now. They are
11 developing their methodology that they would like us
12 to endorse at some point. There are, of course, other
13 regulatory bodies in other technical communities.
14 We're working with NASA, FRA, and various other
15 organizations that have been much more proactive in
16 this area in various ways.

17 As we develop the regulatory stuff, we're
18 going to have public meetings and workshops that get
19 into it. Basically this is just a rehash of what we
20 talked about. We have the three different areas that
21 are proceeding in parallel. I haven't left much time
22 for additional questions and discussion. But I would
23 be happy to provide any additional comments --

24 MEMBER APOSTOLAKIS: You didn't get
25 enough.

1 MR. ARNDT: Or specific technical issues
2 that we didn't have a lot of time to talk about as
3 well as where we are going and things like that.

4 MEMBER SEIBER: If there are no questions,
5 Mr. Chairman, we'll go back to you.

6 CHAIRMAN BONACA: No additional questions?

7 MEMBER APOSTOLAKIS: No, you cut us off.

8 MEMBER RANSOM: I'm wondering, does your
9 work include --

10 VICE CHAIRMAN WALLIS: Did you say there
11 was an example of success sometime?

12 MR. ARNDT: I mentioned a couple of
13 things.

14 VICE CHAIRMAN WALLIS: Not necessarily in
15 this meeting, but can we see that?

16 MR. ARNDT: Yes, what I think would be the
17 best way of doing it is to work with --

18 VICE CHAIRMAN WALLIS: The subcommittee.

19 MR. ARNDT: Mr. Sieber and Dr. Apostolakis
20 to talk about specific programs and their
21 accomplishments as it becomes appropriate.

22 MEMBER APOSTOLAKIS: Absolutely.

23 MR. ARNDT: We can have a half day
24 subcommittee meeting on the particulars.

25 MEMBER RANSOM: I'm wondering if your work

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1 or program includes the basic transducers for
2 measuring pressure, temperature, and things like that.
3 Some of them require analog/digital conversion at the
4 transducer. Some of them may have - I don't know -
5 today technology where you get a digital to start out
6 with.

7 MEMBER SEIBER: It always starts as
8 analog.

9 MR. ARNDT: Yes, the program as a whole
10 looks at not only digital systems but also transducers
11 and meters and things like that and particular issues
12 associated with them. One of the programs looks at
13 the trend now to put digital information processing at
14 the transducer level, what is colloquially referred to
15 as smart sensors. So we're looking at that. As that
16 becomes an important part of the reliability
17 calculation, then that would be included. Right now,
18 it's mostly the failure of the analog sensor of some
19 sort would be a number based on some reliability data
20 that we have for various sensors.

21 MEMBER SEIBER: A component switch is a
22 digital thing.

23 CHAIRMAN BONACA: If there are no further
24 questions, I guess we'll plan a subcommittee meeting
25 in the early fall and have an update on this.

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1 MEMBER APOSTOLAKIS: I think we should.
2 This is a very important issue. We should keep
3 abreast of what you guys are doing have a dialogue.

4 MR. ARNDT: Sure.

5 MEMBER APOSTOLAKIS: We don't need to
6 review final points.

7 CHAIRMAN BONACA: All right.

8 MEMBER SEIBER: Well, before we end, I
9 would like to thank Steve and the staff for their
10 presentation. It's always extra work to have to put
11 one of these together and a trying experience to
12 deliver it.

13 MEMBER APOSTOLAKIS: It's a pleasure too
14 though.

15 MR. ARNDT: Absolutely.

16 MEMBER SEIBER: It certainly is.

17 MEMBER POWERS: I think I would agree with
18 Professor Apostolakis's important area because it's
19 new and novel and somewhat exciting and things like
20 that. The challenge I think that you face is you need
21 to educate us a little more on the specifics. It
22 wouldn't hurt for you to put us on the distribution of
23 reports that your work generates and things like that
24 so that we can get a little better understanding of
25 the specifics on this and even some of the more

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1 salient review papers in the field.

2 I think the older hands here are familiar
3 with the National Academy of Sciences report, which
4 I'll be quite blunt with you, I gleaned next to
5 nothing from. I believe that was the general feeling
6 of the ACRS on the report. It was not very helpful to
7 us.

8 MR. ARNDT: At the risk of being a
9 shameless promoter, for those of you who are
10 interested, the American Nuclear Society sponsors a
11 meeting on I&C and human factors and man-machine
12 interface once every three years. That happens to be
13 coming up in September of this year.

14 MEMBER APOSTOLAKIS: You are one of the
15 organizers.

16 MR. ARNDT: I'm actually the general
17 chair. But probably at least a quarter of the papers
18 are out on this particular subject of digital
19 reliability.

20 MEMBER POWERS: Where is it, Steve?

21 MR. ARNDT: It's in Columbus, Ohio.

22 MEMBER POWERS: Good God. That's not
23 going to attract very many people.

24 (Laughter.)

25 MR. ARNDT: It's a technical meeting.

1 VICE CHAIRMAN WALLIS: Are these academic
2 papers or are they industrial papers? For people who
3 know how to design a system, do we have a prescribed
4 reliability?

5 MR. ARNDT: We have papers from all over
6 the world. Probably about 40 percent are academic.
7 A good 30 percent are industrial, some regulatory
8 bodies. It's a very broad cross section.

9 MEMBER APOSTOLAKIS: It's a hell of a lot
10 of papers there, but a hell of a lot of them are
11 really bad.

12 VICE CHAIRMAN WALLIS: There are all in
13 digital form.

14 CHAIRMAN BONACA: When is the meeting
15 going to take place?

16 MEMBER POWERS: It's in Columbus, Ohio.
17 When are the dates?

18 MR. ARNDT: It's September 19 through 22.

19 MEMBER POWERS: Mr. Chairman, can I go to
20 this meeting?

21 CHAIRMAN BONACA: You are absolutely
22 welcome to.

23 MR. ARNDT: It's a shameless promotion.

24 MEMBER APOSTOLAKIS: If he said "Columbus,
25 China," you would go.

1 MEMBER POWERS: I have to get these guys
2 to approve it. It's not in some salubrious locale
3 like Kyoto, Japan so they might actually.

4 CHAIRMAN BONACA: All right. I think we
5 need to wrap it up. Thank you for your presentation.
6 We are going to be going off the record now.

7 (Whereupon, the above-entitled matter
8 concluded at 5:27 p.m.)

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CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: Advisory Committee on
Reactor Safeguards

513th Meeting

Docket Number: n/a

Location: Rockville, MD

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.



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Nuclear Regulatory Commission*

**RISK-INFORMED PART 50
SPECIAL TREATMENT REQUIREMENTS
10 CFR 50.69**

**ACRS FULL COMMITTEE
513th MEETING
JUNE 2, 2004**

**Timothy Reed
Office of Nuclear Reactor Regulation
US Nuclear Regulatory Commission**



BRIEFING OBJECTIVE

- **To brief the Committee on 10 CFR 50.69 final rulemaking and gain the Committee's endorsement on the final rule (requesting a letter)**

- **Focus of the discussion will be:**
 - **Changes from February 2004 subcommittee briefing**
 - **Changes to the package provided to ACRS on May 17, 2004**
 - **RG 1.201 (remaining issues)**



INTRODUCTION/STATUS

- **Briefed ACRS Subcommittee on Reliability and Probabilistic Risk Assessment on February 19, 2004**
- **February 2004 briefing focused on public comment resolution - NEI 00-04 review status**
- **Clarifications to rule in response to public comments implemented into final rulemaking package as discussed at February 2004 briefing**



*United States
Nuclear Regulatory Commission*

NOTEWORTHY CHANGE TO RM PACKAGE

- **Applicants for Part 52 Design Certifications removed from 50.69:**
 - **Difficult issues identified with Design Certification applications - (e.g., how to allow SSCs to change RISC categories over time per 50.69 monitoring/feedback vs Part 52 restrictions on changes)**
 - **Part 52 COL applicants can still reference certified designs and apply 50.69**



ONGOING TASKS TO ISSUE 50.69

- **Review/concurrence process for final rulemaking process**
 - meet with CRGR (mid June)
 - deliver final rulemaking package to EDO - 6/23
 - deliver final rulemaking package to Commission - 6/30

- **RG 1.201 issue for trial use - update/revise with lessons learned from pilots**

Regulatory Guide 1.201

Guidelines for Categorizing Structures, Systems, and
Components in Nuclear Power Plants According to Their
Safety Significance

RG 1.201

Endorsement of NEI 00-04

- Received NEI 00-04 Final Draft in April 2004
 - ▶ Incorporated a Number of Changes Due to Staff Comments on Revision C (DG-1121) and Revision D
 - ▶ Many Staff Positions in DG-1121 Addressed Directly or Staff Position has Changed with Better Understanding of the NEI 00-04 Approach

- Staff Provided Comments on NEI 00-04 in May 2004
 - ▶ Comments are captured in RG 1.201 Positions

- NEI Addressing Staff Comments

RG 1.201

Key General Comments

- Implementation Limitations Depend on Types of Analyses Used in Categorization
- PRA Quality Attributes
- Uncertainty Considerations
- Common Cause Failure/Degradation Mechanism Considerations

RG 1.201

Key Specific Comment Topics

- Interpretations/Clarifications
 - ▶ Many carry-over from DG-1121
- Regulatory/Legal Clarifications
- Technical Clarifications
 - ▶ SSCs Screened out of Seismic PRA Due to Seismic Robustness
 - ▶ Addressing Self-Assessment Findings
 - ▶ IDP considerations
- Technical Objections
 - ▶ RISC-3 SSC Reliability Reduction Factor Assumed in Risk Sensitivity Study (Implementation Issue)

RG 1.201

IDP Considerations

- Rule Requires IDP be Staffed with Expert, Plant-Knowledgeable Members
- NEI 00-04 Section 9.1 Provides Additional Information on Panel Makeup and Training
 - ▶ Licensees Establish Specific Requirements to Ensure and Maintain Adequate Expertise of IDP Members
 - ▶ Key Areas of Emphasis are Experience at Specific Plant and Experience with Plant-Specific Risk Information
 - ▶ IDP described in Formal Plant Procedure, including Training and Qualifications of Members
- At ASME/ANS Joint Meeting IDP Qualifications Identified as an Action Item for Future Consideration

RG 1.201

Rationale for Issuing For Trial Use

- Remains 1 Technical Issue
- Some Supporting Guidance Documents Still Not Finalized
 - ▶ N-660 Guidance
- Though Staff Does NOT Expect to Need to Make Major Changes, Will Learn from Early Implementation/Pilots

RG 1.201

Summary

- NEI is Addressing Latest Set of Staff Comments
 - ▶ Only 1 Technical Objection Remains (which is more an Implementation Issue than a Categorization Issue)

- Staff will Continue to Work with NEI to Address Staff Comments and Develop Final Version of NEI 00-04 that is Endorseable with Few, if Any, Conditions/Exceptions

- Staff will Continue to Work with NEI During Early Implementation of Rule to Refine Guidance
 - ▶ Develop Submittal Template



Improved License Renewal Application Review Process

Presented to
ACRS
June 2, 2004

Kurt Cozens, Senior Materials Engineer
License Renewal Section B
License Renewal and Environmental Impacts Program
U. S. Nuclear Regulatory Commission

1



Objective

- ▶ To provide an overview of the improved LRA review process
 - ▶ Why change
 - ▶ What's changed and what's not
 - ▶ Project team's audit and review process

2



Why Change?

3



Projected Schedule of License Renewal Applications Through FY07**

Plant	Start	FY03				FY04				FY05				FY06				FY07				
		TU	W	TH	F	TU	W	TH	F	TU	W	TH	F	TU	W	TH	F	TU	W	TH	F	
St. Lucie 1,2	Nov-01					Completed																
Fort Calhoun	Jan-02					Completed																
Robinson 3	Jun-02									Completed												
Oljns	Aug-02									Completed												
Bumgar	Aug-02									Completed												
Dresden 2,3	Jan-03																					
Quad Cities 1,2	Jan-03																					
Farley 1,2	Sep-03																					
ANO-3	Oct-03																					
D.C. Cook 1,2	Nov-03																					
Browns Ferry 1,2,3	Jan-04																					
Milstone 2,3	Jan-04																					
Point Beach 1,2	Feb-04																					
New Miss Pt. 1,2	May-04																					
Beaver Valley 1,2	Sep-04																					
Projected	Oct-04																					
Brunswick 1,2	Nov-04																					
Unannounced (1)	20																					
Monroe	20																					
Energy Plant (1)	Jul-08																					
Oyster Creek	Jul-08																					
Energy Plant (1)	Dec-08																					
Susquehanna 1,2	40																					
Energy Plant (2)	Jul-08																					
Unannounced (2)	Jul-08																					
Projected	Aug-08																					
Wolf Creek	Sep-08																					
Harris	10																					
Projected	Nov-08																					
Unannounced (3)	Jan-07																					
Neville 1,2	Jun-07																					
Hope Creek	40																					
Beth	40																					

Applications under review - NO HEARING (33 months)
 Applications under review - Opportunity for HEARING PENDING (36 months)
 Applications under review - In HEARING PROCESS (36 months)
 Planned Applications - NO HEARING (22 months)

May 18, 200

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Benefits of change

- › Leverage resources to perform simultaneous reviews
- › Take advantage of efficiencies inherent in the license renewal guidance documents

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What's Changed and What's Not Changed

6



What's changed?

- › Standardized approach
- › Dedicated audit and review teams
- › Front loaded schedule
- › Division of work

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Distribution of work

STEP	LRA REVIEW ACTIVITY	RESPONSIBLE ORGANIZATION	
		Original Approach	Improved Approach
1	LRA acceptance	RLEP-A	RLEP-A
2	Scoping and screening methodology	DIPM	DIPM
3	Scoping and screening results	DSSA	DSSA
4	Aging management review results	DE	DE & RLEP-B
5	Aging management programs	DE	DE & RLEP-B
6	Time-limited aging analyses	DE	DE
7	Environmental assessment	RLEP-C	RLEP-C

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AMP & AMR assignments

- RLEP-B reviews AMPs and AMRs that are:
 - Consistent with GALL Report
 - Based on NRC approved precedents
- DE reviews
 - Remaining AMPs
 - Emerging issues

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Typical work splits

PLANT	AMPs ASSIGNED (%)		AMRs ASSIGNED (%)	
	DE	RLEP-B	DE	RLEP-B
ANO2, UNIT 2	18	82	37	63
DC COOK, UNITS 1 & 2	23	77	28	72
POINT BEACH, UNITS 1 & 2	17	83	17	83

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RLEP-B Team AMR and AMP Reviews

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| Team composition

- › NRC team leader
 - › NRC backup team leader
 - › Five engineering disciplines
 - › Materials
 - › Mechanical
 - › Structural
 - › Systems
 - › Electrical
-

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Team's LRA review process

- ▶ Assemble a team
- ▶ Prepare a plan
- ▶ Prepare for the reviews
- ▶ Perform reviews
 - ▶ GALL Report
 - ▶ SRP-LR
- ▶ Document the results of the reviews
 - ▶ Audit and review report
 - ▶ SER input
- ▶ Feedback lessons learned

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Use of questions versus RAIs

- ▶ Site visits permit use of questions to obtain clarification
 - ▶ Applicant may chose voluntary docketed submittal, if warranted
 - ▶ Use of questions during site visits integral part of front loaded schedule
- ▶ RAIs used when docketed responses necessary

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Audit and review plan

- Work assignments
 - Schedule
 - Formal process for performing the audits and reviews
 - Tools for the team members
 - Process flow diagrams
 - Worksheets and checklists
 - Guidelines for reporting the results of the reviews
-

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What's involved in the AMP reviews?

- Plant AMPs consistent with GALL AMPs
 - Verify consistency by comparing program elements
 - 7 of 10 program elements reviewed by project team
 - Review exceptions and enhancements
 - Provide technical basis to accept inconsistency
 - Plant specific AMPs
 - Review per Appendix A of SRP-LR
 - Technical review to 10 CFR 54.21(a)(3)
 - NRC approved precedents
-

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What's involved in the AMR reviews?

- AMR types
 - Consistent with GALL
 - Consistent, but require further evaluation
 - Based on NRC approved precedents
- Initial AMR reviews may be performed in office
 - Complete AMR reviews, where possible
 - Develop questions
- Site visits
 - Resolve questions

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Documentation

- Audit and review report
 - Document AMP and AMR audits and reviews
 - Majority of contents transferred to SER input
- SER input
 - Sections 3.0 – 3.6 of SER
 - Addresses RAIs

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Updating License Renewal Guidance Documents

Jerry Dozier
License Renewal and
Environmental Impacts - B

License Renewal Guidance Documents

- NUREG-1800, *Standard Review Plan for License Renewal Applications for Nuclear Power Plants*
- NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*
- RG 1.188, *Standard Format and Content for Applications to Renew Nuclear power Plant Operating Licenses*



Objectives

- Incorporate lessons learned to make GALL a better document
- Increase applicant and review efficiency



Activity

- The GALL update will involve component consolidations, reformatting, correction of errors, and incorporation of approved staff positions (Precedents, Interim staff guidance)
- Corresponding changes to the SRP-LR will also be developed including update to incorporate new review approach.



Schedule

- A preliminary draft GALL and SRP will be available on the Web by 9/30/04
- Final GALL, SRP, and Bases document expected to be ready for use in early 2006





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Overview of NRC Digital I&C Research Program in Digital Systems Reliability

Advisory Committee on Reactor Safeguards

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Office of Nuclear Regulatory Research

June 2, 2004



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- On March 26th RES briefed the ACRS Subcommittee on Plant Operations on the NRC digital systems reliability research program
- This presentation provides an overview of the information presented to the subcommittee



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OVERVIEW

- Conclusions
- Review of digital I&C research program
- Drivers and boundary conditions
- Digital systems reliability program
- Research projects
- Interfaces
- Summary



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CONCLUSIONS

- US nuclear industry is moving forward to retrofit digital systems into control, monitoring, and protection systems throughout the plants. The NRC research efforts will provide tools, methods, and guidance to support reviews in this area.
- A part of the RES instrumentation and control research program is devoted to supporting the research needed to develop digital systems risk and reliability information, models and guidance.
- Research at several universities, and national laboratories supplemented by in-house efforts are part of an integrated program to develop tools and methods to evaluate these digital systems and to support the development of regulatory guidance.



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DIGITAL I&C RESEARCH PROGRAM

- SECY-01-0155, NRC Digital Instrumentation and Control Research Plan, published in August 2001
 - Established research objectives and program areas
 - Reviewed and endorsed by ACRS
 - Contained four main program areas including digital systems reliability
- Since SECY-01-0155, additional areas have been added including future reactors
- Revision to research plan is currently under development (available in forth quarter of FY 2004)



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I&C RESEARCH PROGRAM GOAL

“Continually improving the staff’s analytical capabilities, and fundamental knowledge of I&C technology as demonstrated by the development of analytical tools, technical reports, regulatory guidance, papers and articles, and interaction with licensees, vendors, research organizations, and the public.”



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PROGRAM EXTERNAL DRIVERS

- National Academy of Sciences and Engineering/National Research Council (NAS) report recommendations, 1997
- As new technology has become available, NRC licensees have been moving to more modern control and protection systems
- New systems have different failure modes and are more difficult to analyze.
- NRR User Need, provided in March, 2000 and Reaffirmed in July, 2002
- DOE I&C and HMI Working Group Recommendations, and Halden Workshop on Digital System Reliability, 2002
- EPRI D3 Draft Topical, 2004



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I&C RESEARCH PROGRAM AREAS

- System aspects of digital technology
- Software quality assurance
- Digital systems reliability
- Emerging I&C technologies and applications
- Future Reactors



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NAS REPORT RECOMMENDATIONS

- “Include the relative influence of software failures on system reliability in PRAs”
- “Develop methods for estimating digital system failure probabilities, including COTS. Include acceptance criteria, guidelines, limitations, rationale and justifications”
- “Develop advanced techniques for analyzing digital systems to increase confidence and reduce uncertainty in quantitative assessments”
- “NRC and industry should evaluate their capabilities and develop a sufficient level of expertise to understand the requirements for gaining confidence in digital implementations of system functions and the limitations of quantitative assessments”



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WHAT IS NEEDED IN DIGITAL SYSTEMS PRAs

- Develop methods for reviewing digital system reliability models
 - Understanding the state of the data
 - Digital system failure mechanisms
 - Strengths and limitations of digital system models
 - Incorporating digital system models into PRAs
 - Acceptance criteria (quality of modeling, etc.)



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DIGITAL SYSTEMS RELIABILITY MODELING

- Modeling of digital systems should be realistic to:
 - Account for the most important system characteristics
 - Model important failure modes
 - Be able to predict system behavior (including system reliability)
 - Be consistent with available data
- Modeling issues
 - Availability of reliability data
 - Level of detail of the models
 - Independence of hardware and software
 - Software diversity
 - Number of possible states and the ability to test



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DIGITAL SYSTEMS RELIABILITY PROGRAM

- An integrated program plan is being developed for the digital systems reliability program within the instrumentation and control research program (will be available in fourth quarter of FY 2004)
- The program consists of three elements
 - Development of quantitative digital systems models that can be used to determine digital system failure modes and reliability estimates
 - Development of methods for integration of reliability models that are capable of modeling digital systems (Dynamic Fault trees, Markov, Dynamic flow graph, Petri nets, etc.) into current PRAs to support risk-informed regulatory applications
 - Establishment of regulatory guidance, including modeling quality and acceptance criteria



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DIGITAL SYSTEMS RELIABILITY PROGRAM (CONT.)

- Development of quantitative digital systems models that can be used to determine digital system failure modes and reliability estimates
 - This part of the program includes the development of both models for software and integrated hardware-software systems
 - The models will be first evaluated on their ability to provide meaningful quantitative information on digital system performance
 - The models will then be modified or adapted to provide information needed for risk and reliability assessments



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DIGITAL SYSTEMS RELIABILITY PROGRAM (CONT.)

- Development of methods for integration of reliability models that are capable of modeling digital systems (Dynamic Fault trees, Markov, Dynamic flow graph, Petri nets, etc.) into current generation PRAs to support risk-informed regulatory reviews
 - Both traditional methods (FMECA, etc) for developing fault tree models and dynamic modeling methods will be evaluated
 - Integration methods will be developed
 - All new models and methods will be piloted



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DIGITAL SYSTEMS RELIABILITY PROGRAM (CONT.)

- Establishment of regulatory guidance, including modeling quality and acceptance criteria
 - NRC position on what is acceptable as the “default” level of analysis
 - Which of the various analysis methods are acceptable
 - How software and its hardware context needs to be modeled
 - How much and what kind of data is needed to support reliability models
 - The acceptable level at which component failures should be modeled
 - How the system operation profile is to be developed
 - Acceptance criteria for both the modeling fidelity and the system reliability



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DIGITAL SYSTEMS RELIABILITY PROGRAM (CONT.)

- Implementation
 - All three parts of the program will proceed in parallel
 - Part one (digital system modeling) will be carried out by UVa, UMd, and Halden
 - Part two (PRA modeling and integration) will be carried out by BNL, Ohio State, and In-house efforts
 - Part three (Guidance Development) will be carried out primarily through in-house efforts



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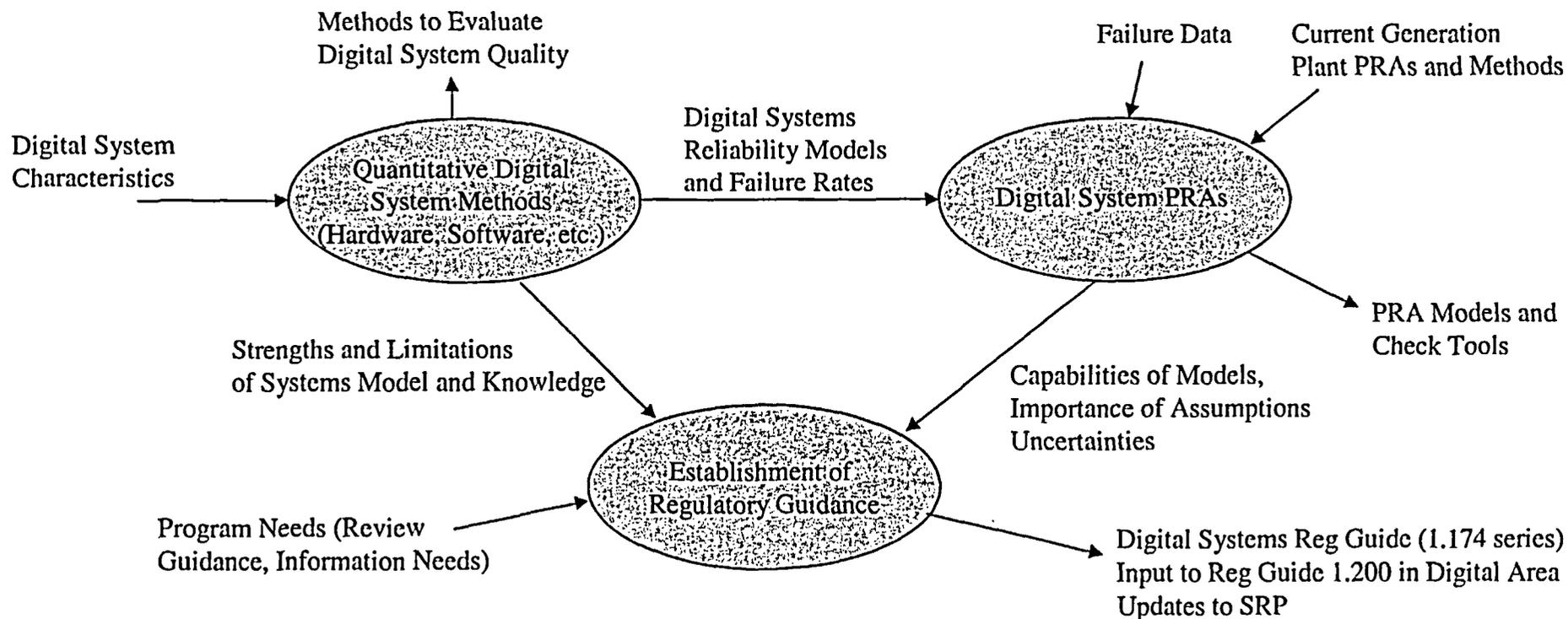


Diagram of Digital System Reliability Program



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Primary issues	Approach	Resources
<p>Digital systems have different failure modes, and are much more challenging to model. More quantitative methods are needed</p>	<p>Gain a better understanding of how these systems fail and how likely it is that they will fail in use. Develop models and methods for evaluating how digital system fail.</p>	<ul style="list-style-type: none"> •University of Virginia (systems analysis) •Halden (requirements analysis) •University of Maryland (software)
<p>Digital systems are being retrofitted into current generation of nuclear power plants and they need to be reviewed in a risk informed manner</p>	<p>Develop methods and tools for including digital system models into PRA</p> <ul style="list-style-type: none"> a) Develop a better understanding of current data and generate application specific databases b) Develop new methods for integrating current methods of digital system modeling into current PRAs c) Pilot methods using plant-specific PRAs plants and validate the models using available data on digital system failures. d) Develop ways to estimate uncertainty in quantitative assessments 	<ul style="list-style-type: none"> •Brookhaven National Lab (database review and evaluation, and pilot studies) •NRC staff (new methods, and pilot studies) •Ohio State (Dynamic PRA, uncertainty and pilot studies) •International cooperative programs (COMPSIS, etc.)
<p>The NRC does not have guidance on what is acceptable and what is not in the modeling of digital system reliability</p>	<p>Develop guidance for regulatory applications involving digital systems reliability</p> <ul style="list-style-type: none"> • acceptance criteria • limitations • evaluation methods • reliability data 	<ul style="list-style-type: none"> •NRC staff •Brookhaven National Lab



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RESEARCH PROJECTS

- UVa Integrated digital systems modeling project
- UMd software metrics project
- BNL project on digital system risk
- Dynamic reliability modeling project and PRA integration (Ohio State)
- Other research
 - Halden
 - COMPSIS
 - NRC In-house effort



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STRUCTURE OF CURRENT NRC RESEARCH

- UVa integrated digital systems modeling project will provide:
 - An integrated digital system assessment method that can be used by the NRC staff to independently assess digital system safety
 - Information on digital systems failure modes and reliability that will inform the review guidance
 - Information and models that can be used in development of digital systems risk and reliability assessments



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STRUCTURE OF CURRENT NRC RESEARCH (CONT.)

- UMD software metrics project will provide:
 - An assessment method that can be used by the NRC staff to independently assess software quality and reliability
 - Quantitative information on the relative importance of software metrics will be used to inform the current review guidance
 - Input to guidance on quantitative software quality and reliability



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STRUCTURE OF CURRENT NRC RESEARCH (CONT.)

- BNL project on digital system risk will provide:
 - Draft interim review guidance for risk-informed digital submittals
 - Review current methods and tools for modeling digital systems that will be used in guidance for risk-informed digital submittals
 - Review of digital failure databases
 - Digital system PRA modeling using tradition methods



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STRUCTURE OF CURRENT NRC RESEARCH (CONT.)

- Ohio State dynamic reliability modeling project will provide:
 - Methods for integration of one or more of the digital modeling into current generation PRAs
 - Pilot studies of methods using full scope PRA plants models
 - Methods for estimate uncertainty in quantitative assessments



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STRUCTURE OF CURRENT NRC RESEARCH (CONT.)

- Halden
 - Development of digital systems requirements assessment tools and methods for integration of quantitative and qualitative information
- COMPSIS
 - International effort to develop a database of software failures in computer systems important to safety in nuclear plants, and the lessons learned from these failures
- NRC In-House Effort
 - Several areas including development of guidance, an NRC database of digital system failure information for use in validating reliability modeling assumptions, and work to support PRA integration



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INTERFACES

- As part of the development of guidance in this area the digital systems reliability program will work with several other parts of the NRC and outside stake holders
 - NRR/EEIB and NRR/SPSB in the areas of PRA quality issues, revision of I&C guidance, and integration with other risk initiatives
 - EPRI and other research organizations
 - Other regulatory bodies (NASA, FAA, FRA, etc.)
- Public meetings and workshops will be held to gather input, build consensus and identify options



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SUMMARY

- US nuclear industry is moving forward to retrofit digital systems into current generation nuclear power plants and the NRC is working to provide tools, methods, and guidance to support reviews in this area
- Digital systems reliability program consists of three elements
 - Development of quantitative digital systems models that can be used to determine digital system failure modes and reliability estimates
 - Development of methods for integration of reliability models that are capable of modeling digital systems (Dynamic Fault trees, Markov, Dynamic flow graph, Petri nets, etc.) into current generation PRAs to support risk informed regulatory reviews
 - Establishment of regulatory guidance, including modeling quality and acceptance criteria
- Research at several universities, and national laboratories supplemented by in-house efforts are part of an integrated program to develop tools and methods to evaluate of these systems and to support the development of regulatory guidance.