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1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

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4 ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

5 MEETING OF THE

6 SUBCOMMITTEE ON RELIABILITY AND PROBABILISTIC

7 RISK ASSESSMENT

8 + + + + +

9 Tuesday,

10 April 17, 2001

11 + + + + +

12 Rockville, Maryland

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14 The Subcommittee met at the Nuclear

15 Regulatory Commission, Two White Flint North, Room T-

16 2B3, 11545 Rockville Pike, at 8:30 a.m., Doctor George

17 E. Apostolakis, Chairman, presiding.

18 PRESENT:

19 GEORGE E. APOSTOLAKIS Chairman

20 MARIO V. BONACA Member

21 THOMAS S. KRESS Member

22 GRAHAM M. LEITCH Member

23 ROBERT E. UHRIG Member

24 ACRS STAFF PRESENT:

25 MICHAEL T. MARKLEY

1 ALSO PRESENT:

2 TOM BOYCE	NRR
3 STEVE EIDE	INEEL
4 ADEL EL-BASSIONI	NRR
5 TOM HOUGHTON	NEI
6 ROGER HUSTON	Licensing Support Services
7 MICHAEL R. JOHNSON	NRR
8 STEVEN E. MAYS	NRR
9 DEANN RALEIGH	LIS, Scientech
10 JENNY WEIL	McGraw-Hill
11 TOM WOLE	RES
12 BOB YOUNGBLOOD	ISL

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A-G-E-N-D-A

AGENDA - (Continued):

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

2 (8:30 a.m.)

3 CHAIRMAN APOSTOLAKIS: The meeting will now
4 come to order. This is a meeting of the Advisory
5 Committee on Reactor Safeguards Subcommittee on
6 Reliability and Probabilistic Risk Assessment. I am
7 George Apostolakis, Chairman of the Subcommittee.
8 Subcommittee Members in attendance are Tom
9 Kress, Graham Leitch, and Robert Uhrig, and Mario
10 Bonaca.
11 The purpose of this meeting is to discuss
12 the results of the staff's Phase 1 effort to develop
13 risk-based performance indicators. The Subcommittee
14 will gather information, analyze relevant issues and
15 facts, and formulate proposed positions and actions,
16 as appropriate, for deliberation by the full
17 Committee. Michael T. Markley is the Cognizant ACRS
18 Staff Engineer for this meeting.
19 The rules for participation in today's
20 meeting have been announced as part of the notice of
21 this meeting previously published in the *Federal*
22 *Register* on March 26, 2001.
23 A transcript of the meeting is being kept
24 and will be made available as stated in the *Federal*
25 *Register Notice*. It is requested that speakers first

1 identify themselves and speak with sufficient clarity
2 and volume so that they can be readily heard.
3 We have received no written comments or
4 requests for time to make oral statements from members
5 of the public regarding today's meeting.
6 We will now proceed with the meeting and
7 I call upon Mr. Steve Mays to begin.
8 MR. MAYS: Thank you, George. I'm Steve
9 Mays from the Office of Nuclear Regulatory Research.
10 With me today at the front is Hossein Hamzehee, who is
11 the Project Manager for working on risk-based
12 performance indicators, and with me also to my left is
13 Tom Boyce from the Office of Nuclear Reactor
14 Regulation, who will speak in a couple minutes about
15 the relationship that this work has to the Reactor
16 Oversight Process. Also here at the side table is
17 Mike Johnson, who is the Section Chief in NRR, who is
18 our technical counterpart in NRR and our liaison with
19 this work, and we have a couple of our contractors in
20 the audience if there's any questions that I can't
21 directly answer or Hossein can't answer, they can come
22 up and give additional information about what we've
23 done.
24 What we are trying to do today is give the
25 ACRS an opportunity to provide some comments and to

1 provide some information to you about what was in the
2 report that we issued in January. We've already held
3 one public meeting in February to kind of lay out
4 what's in the report, and kind of frame the discussion
5 of what we are trying to do, and how we went about
6 doing it, so that when we have our public meeting next
7 week we would have the opportunity to make sure that
8 was a well-focused meeting and directed towards the
9 kinds of things we need to know what the response from
10 the outside stakeholders is.
11 We extended our comment period at the
12 request of people in the February meeting to May, so
13 that people can come to the meeting next week, discuss
14 points, get the opportunity to hear some answers from
15 us if they do, and then be able to take that into
16 consideration as they give us their formal comments in
17 May. We are looking forward to that meeting, and part
18 of what we are going to see here today is some new
19 stuff that we've done that's not actually in the
20 report, and we are going to also present that at the
21 meeting next week, so that we can hopefully move this
22 process along.
23 So, we are looking for feedback from the
24 ACRS, we expect probably a letter of some kind with
25 respect to whether they believe that the work we are

1 doing is a potential benefit to the Reactor Oversight
2 Process, whether we've gone about that in a
3 technically sound manner, and also to get some
4 feedback on the alternate approaches that we're going
5 to present today, which are not in the report, that
6 we've gone off and developed in light of some of the
7 early comments we got, both internally from the NRC
8 review, as well as some comments we've had from
9 external stakeholders relating to the total number of
10 potential indicators and what that impact would be on
11 the oversight process.
12 So, we are going to have this briefing
13 broken up into several pieces. The first part is the
14 relationship of the RBPIs to the Reactor Oversight
15 Program. Tom Boyce from NRR to my left will be
16 discussing that. Then I will come back and the rest
17 of the presentation will be primarily from our part on
18 the technical aspects of what's been done, including
19 what we see as the potential benefits, what we
20 actually did in development, some results that we
21 have. We want to go over the key implementation
22 issues that are before us, because we think those tend
23 to be the ones that we have the biggest comments on
24 from both internal and external reviewers so far, and
25 to go over the alternate approaches that we're looking

at as a means of dealing with some of the issues that have been raised.

So, with that, I would like to go to Tom Boyce, who will discuss the relationships of the RBPIs to the Reactor Oversight Process.

MR. BOYCE: Good morning.

As Steve said, I'm Tom Boyce, I'm in the Inspection Program Branch in the Office of NRR, and NRR requested that we have a short amount of time at the beginning of Research's presentation to let you know the relationship, as NRR sees it, of the risk-based PI development program to the current performance indicators in the Reactor Oversight Process.

CHAIRMAN APOSTOLAKIS: Is your presentation consistent with the memorandum from Mr. Dean to Mr. King, of December 1, 2000?

MR. BOYCE: It is entirely consistent. I was the author of that memo.

CHAIRMAN APOSTOLAKIS: Okay, good.

MR. BOYCE: By definition.

CHAIRMAN APOSTOLAKIS: You may have changed your mind.

MR. BOYCE: I maybe shouldn't have stated it quite so positively.

1 Before I talk about the Reactor Oversight
2 Process relationship to risk-based PIs, it's important
3 to understand the overall environment with which our
4 agency is now regulated, and some of the changes that
5 are impacting the nuclear industry.
6 The Commission has provided direction to
7 the staff that its intent is to better risk inform the
8 NRC's processes, and it's done this for several years
9 on a variety of fronts. The Reactor Oversight Process
10 was revised in 1999 to be more risk informed,
11 objective, understandable and more predictable than
12 the previous oversight process. The Reactor Oversight
13 Process was implemented on April 2, 2000, so we have
14 had one year of practice in the Reactor Oversight
15 Process under our belts.
16 Another backdrop for the industry is
17 continuing advances in the use of information
18 technology and data. Industry is getting better and
19 better at collecting data, processing it for its own
20 internal uses. We also are getting better at it. The
21 Reactor Oversight Process has got a web site that has
22 gathered a great deal of kudos for its ability to
23 present information.
24 The internet and PCS have allowed much
25 more free exchange of information than has previously

1 been allowed, and both NRC and industry are continuing
2 to expand their capabilities in this area.
3 We wrote about the bases for the Reactor
4 Oversight Process in two Commission papers in early
5 1999, and there we stated that the Reactor Oversight
6 Process would use a combination of inspection findings
7 and performance indicators to provide oversight of
8 industry. We conducted a pilot program in 1999, and
9 the results were articulated in SECY-00-049. In that
10 same Commission paper, we stated that while the future
11 success of the Reactor Oversight Process would not be
12 predicated on the risk-based PI program, we thought
13 that there were a couple of places where the risk-
14 based PI program could, in fact, enhance our current
15 set of performance indicators.
16 These areas are actually articulated in
17 the last bullet right here, the reliability
18 indicators, unavailability indicators, shutdown and
19 fire indicators, and containment indicators.
20 We also thought that the risk-based PI
21 program offered the potential to establish, perhaps,
22 plant specific thresholds for these PIs on the current
23 set of PIs. Because we thought this, we decided to
24 task research to develop in these areas, and we sent
25 them a user need. Research responded that they would

1 examine the feasibility of these selected risk-based
2 PIs as part of their Phase 1 report, and you'll be
3 hearing more about that in a little bit.
4 Even though the risk-based PI program is
5 moving forward, we thought that there were several key
6 implementation issues that needed to be addressed
7 prior to implementing the risk-based PIs
8 incorporating them into the Reactor Oversight Process.
9 One of the keys, in general, is data quality and
10 availability. Our experience in the Reactor Oversight
11 Process is, is that while data is being collected by
12 individual licensees there are a variety of ways that
13 you can collect that data. There is a variety of
14 quality for that data, and how you collect that data
15 and pull it together into a graph that is presentable,
16 we found surprising variation. So, we thought that we
17 needed to be happy with the way data was collected, so
18 that it was done uniformly and consistently, before we
19 are able to implement it in the Reactor Oversight
20 Process.
21 Second, we thought that the models used
22 for assessing the data needed to be developed and
23 validated by licensees and the NRC staff in the
24 regions, and you'll hear more about the status of
25 development of SPAR models from Steve, but those two

1 were the key areas that we thought needed to be fully
2 mature before it was ready to be incorporated in the
3 Reactor Oversight Process.
4 CHAIRMAN APOSTOLAKIS: I'm a bit confused
5 now. Isn't this, aren't these two applicable to the
6 existing revised Reactor Oversight Process? I mean,
7 you also need good data, you also need some sort of a
8 PRA, to assess the significance of a particular
9 performance indicator being above a number and so on.
10 So, I don't know, why are these two issues,
11 implementation issues, so important to risk-based
12 performance indicators, but not to the existing
13 oversight process?
14 MR. BOYCE: Well, in the case of the
15 existing performance indicators for the ROP, we had an
16 opportunity to go through a pilot program, licensees
17 submit the data directly to the NRC, using mutually
18 agreed upon guidelines in the NEI document, NEI 99
19 Tech 02. That was developed by mutual discussions
20 with industry, over an extended and intensive — an
21 extended period of time in an intensive manner. The
22 current data for the risk-based PI program is drawn
23 from sources such as the EPIX database, that's, I
24 believe, under the auspices of INPO, and that same
25 sort of rigorous look at how the data is submitted has

1 not been applied yet.

2 CHAIRMAN APOSTOLAKIS: But, it could.

3 MR. BOYCE: It could.

4 CHAIRMAN APOSTOLAKIS: It could, I mean,

5 they could do the same – first of all, I don't like

6 this idea of they and us, I mean, it's one agency, but

7 there is nothing in the methodology that says, you

8 know, you have to use EPIX.

9 MR. BOYCE: Correct.

10 CHAIRMAN APOSTOLAKIS: They can use the

11 data that you are using.

12 Now, they felt the need to go to other

13 sources of data, because for some reason the data that

14 we receive right now is not sufficient, is that the

15 idea, Steve?

16 MR. MAYS: Yes, George. Let me propose

17 we'll get into that in much more detail in the section

18 where we talk about implementation issues, but to

19 address it shortly, remember when the ROP was put in

20 place one of the key issues for getting indicators was

21 what information is readily available and can be put

22 together in a consistent way, and that data that's

23 reported into the ROP is reported under 50.9

24 requirements for licensee submittal of data. That's

25 one of the major issues with respect to implementation

1 of these PIs, and that data that's being submitted
2 under the ROP was not specifically tailored to certain
3 aspects, like reliability indicators, and the models
4 in the ROP were more generic with respect to the
5 thresholds.
6 So, there were several things of that
7 nature that I would put in the category of expediency,
8 that required that to be there, and as we move to more
9 detailed and more plant-specific data and thresholds,
10 we think it's important to make sure that we have an
11 understanding of what that data is and a common
12 agreement as to how the quality of the data needs to
13 be assured and how that stuff needs to be reported,
14 and that's an implementation issue we're going to have
15 to work out, but generically, as long as you have the
16 data that fulfills the model, then that's all you
17 really need from a modeling standpoint and a
18 calculational standpoint, but from a regulatory
19 standpoint there are other issues that have to be
20 addressed.
21 MR. JOHNSON: And, if I could add, Michael
22 Johnson, NRR, if I could add to what Steve has said,
23 and I think he's made some good points, remember the
24 challenges that we face with the ROP PIs, as we'll
25 talk about when we brief the ACRS in May, during the

1 first year of implementation have been challenges
2 associated with verification of the data, even with
3 the relatively simple PIs that we have now in the ROP,
4 it's a problem.
5 So, George, to go to your question, your
6 point, it's not that we don't face these challenges,
7 these similar challenges with the existing ROP, it's
8 that these challenges will certainly exist as we go
9 forward with RBPIs.
10 CHAIRMAN APOSTOLAKIS: Yes, they do exist.
11 Well, I read the memorandum that I
12 mentioned earlier, dated December 1st, from Mr. Dean
13 to Mr. King, and I must admit I was surprised at how
14 cool it is towards this effort, as if somebody is
15 trying to force this upon you and you are resisting.
16 The report did not demonstrate that the
17 proposed RBPIs will be more effective than the PIs
18 currently in place. I don't know what that means.
19 Licensees may be reluctant to voluntarily implement
20 the new RBPIs because of two reasons, there are many
21 more indicators to track, calculate and report, which
22 increases the effort licensees have to expend. So
23 what, if they have to do it, they have to do it.
24 Where is the technical argument? Is there any
25 justification for needing more indicators to track,

1 calculate and report? That should be our criterion,
2 that there is some information there that's useful to
3 us, not that it imposes burden on the licensees.
4 First, we have to decide whether it's unnecessary, and
5 if it's unnecessary then, of course, we don't impose
6 it. But, I didn't see any argument anywhere here that
7 says, no, these additional indicators are not needed
8 because we already cover them. It just says, you know,
9 the licensees will have to spend more time doing it,
10 and, boy, we really don't want to do that, and
11 licensees will be putting themselves in a position
12 where it is much more likely they will have to report
13 a non-green PI and subject themselves to the resulting
14 increased regulatory and public attention. Well, I'm
15 shocked, I'm shocked — shocked. There are indicators
16 that are not green? I just don't understand this
17 memo.
18 You guys don't like something, but you
19 don't want to come out and say it to us. Obviously,
20 you don't like it.
21 MR. JOHNSON: Steve, when we get into —
22 under the implementation issues, will we come back to
23 this topic?
24 MR. MAYS: I think we will.
25 In fairness to — in fairness to Tom and

1 building shock, we'll put that in.

2 CHAIRMAN APOSTOLAKIS: I just didn't want

3 to put Tom on the spot, but he's the one here.

4 MR. MAYS: I know.

5 MR. BOYCE: Thank you, George. I don't

6 mind.

7 CHAIRMAN APOSTOLAKIS: And, he said he

8 wrote it, big mistake.

9 MR. BOYCE: I retract my earlier comments.

10 CHAIRMAN APOSTOLAKIS: Okay.

11 MR. MAYS: Tom hasn't been before the ACRS

12 as often as I and Mike have.

13 In fairness, I think we, in the RBPI

14 report, raise the issues of the implementation because

15 we recognized that if we were going to make an

16 improvement in the ROP it was going to be a voluntary

17 improvement that we decided we wanted and that we

18 negotiated with our external stakeholders to determine

19 it was a benefit to the agency, and I think what you

20 were seeing there was just a recognition of some of

21 the issues that we knew were going to be raised, and

22 that we knew had to be addressed, as opposed to saying

23 that they could not, or should not, be done here. I

24 read that letter when I saw it more as a confirmation

25 that we had identified the correct issue in the RBPI

1 document, and that we knew from our previous
2 interactions with external stakeholders that those
3 were going to be concerns that we had to address, and
4 that the Commission was the one who was eventually
5 going to adjudicate whether or not we were doing that
6 properly or not.
7 So, I don't think it was nearly as
8 negative as you might have portrayed it.
9 CHAIRMAN APOSTOLAKIS: I thought it was
10 cool, there is a certain coolness here, that maybe
11 what you guys are doing has some value, but you have
12 not demonstrated it to us, and what's worse, you may
13 ask the licensees to do more.
14 MR. JOHNSON: Well, there is an aspect of
15 that, and maybe Tom was going to get into that. Let
16 me just say a couple of words before Tom.
17 CHAIRMAN APOSTOLAKIS: You should let him
18 at some point defend it.
19 MR. JOHNSON: Yes, we should.
20 MR. BOYCE: No, go ahead, Mike.
21 MR. JOHNSON: As Steve sort of indicated,
22 there is an aspect of this, and the ROP, when we set
23 out to develop performance indicators, remember the
24 performance indicator aspect of the ROP is a voluntary
25 program, if you will. Even the document that endorses

1 the guidance is — the guidance is an NEI document, NEI
2 99-002, that provides the criteria, we endorse that.
3 CHAIRMAN APOSTOLAKIS: How many licensees
4 have refused?
5 MR. JOHNSON: None of the licensees have.
6 CHAIRMAN APOSTOLAKIS: It is still
7 voluntary?
8 MR. JOHNSON: Yeah. All of the licensees
9 are reporting on their existing PIs.
10 And so, what we are talking about with
11 risk-based performance indicators, as Steve indicated,
12 is an enhancement to this PI reporting program that's
13 a piece of the ROP, and as such, I mean, I think we
14 do, in fact, need to be careful about things like, are
15 we increasing the burden without commensurate benefit?
16 In fact, in our formal change process for the
17 performance indicators, we look at, should we be
18 making reductions in the inspection program, or
19 changes in the inspection program, in areas where we
20 have information that we get readily from the
21 performance indicators, so all of those things have to
22 be worked out in the implementation stages. So, we
23 wouldn't just adopt a suit of PIs that would make us
24 happy, if you will, without regard to the impact that
25 they would have on licensees.

1 CHAIRMAN APOSTOLAKIS: And, I think that's
2 a very reasonable thing to do, as long as there is
3 also a technical discussion —
4 MR. JOHNSON: That's right.
5 CHAIRMAN APOSTOLAKIS: — as to, you know,
6 this indicator gives us information we already have,
7 or maybe expands on something, but by and large we
8 really understand what's going on and the additional
9 burden is not justified.
10 MR. JOHNSON: That's right.
11 CHAIRMAN APOSTOLAKIS: I can see arguments
12 like that, but just to say that, you know, this
13 imposes burden, without addressing the kind of
14 information you get, I find that a little odd.
15 MR. BOYCE: I think there was also a
16 meeting that followed that memo, that was held
17 between, I think, Sam Collins and members of the
18 Research staff, and I think there we were able to get
19 past some of the detailed discussion you saw at that
20 memo, and I think at that meeting we said that we
21 believed that this was a good technical effort, it did
22 have potential value, and we did want them to continue
23 development, which is not stated explicitly in that
24 memo, because the intent of that memo, as I recall,
25 was to convey technical comments on the report itself.

1 CHAIRMAN APOSTOLAKIS: Now, I'm just
2 curious, what would you expect them to do to
3 demonstrate that the proposed RBPIs will be more
4 effective than the PIs currently in place? The word
5 "effective," what does it mean in this context, I
6 mean, independently of the coolness of this, I mean,
7 technically, what would you expect them to do?
8 MR. BOYCE: Well, I'm not sure we've
9 established hard criteria for what we mean by more
10 effective, but, in general, the PIs that we have have
11 certain limitations. I mean, not all of them have
12 been well-founded and risk-informed principles. Some
13 were selected based on 95 percent performance of
14 industry, there's a word, but it's not
15 probabilistically-based, it was, we took a look at
16 histograms and said that 95 percent of the plants
17 operate below this threshold.
18 CHAIRMAN APOSTOLAKIS: So, this is
19 thresholds.
20 MR. BOYCE: Thresholds.
21 CHAIRMAN APOSTOLAKIS: Yes.
22 MR. BOYCE: So, we could certainly improve
23 on our technical basis for thresholds for individual
24 PIs, that's one area.
25 CHAIRMAN APOSTOLAKIS: And, there is a nice

1 criticism of that on page A-10 of Appendix A, very
2 nice. It says, "If I wrote ..."
3 MR. BOYCE: But, we couldn't do that,
4 George, that would be a conflict of interest.
5 MR. JOHNSON: Can I add one other thing to
6 that answer, is that, again, I'll allude to a change
7 of the formal change process. What happens at the end
8 of this effort, and what happens, in fact, when we go
9 to put in place any new PI, as we go through a formal
10 change process, and that process has astute things,
11 like we'll conduct a pilot, we set criteria up at the
12 beginning of that pilot for what we want to see in
13 terms of evaluating the efficacy of these proposed new
14 PIs, and so, it's in those criteria that we'll be very
15 specific about what we'll look for in terms of making
16 a decision about whether to go ahead.
17 And, there's something already — we'll
18 talk to you again in May about two PIs that we already
19 are piloting under the existing ROP that are not risk-
20 based PIs, but they are going through the process. We
21 have a pilot in place, we are looking at the results
22 of that pilot. We are looking at the performance as
23 would be indicated by indicators reported against
24 those proposed PIs, balancing that against the
25 existing PIs to see if there are differences. So,

1 it's those kinds of things that you look at, and those
2 are built into this formal process that we enter into,
3 after this phase of this preliminary development of
4 the RBPIs is finished.
5 MR. BOYCE: And finally, one more comment
6 on the tone of that memo. We had gotten informal
7 feedback from some stakeholders that the risk-based PI
8 program had, through whatever means, been perceived as
9 a certainty, that it would, in fact, be implemented.
10 And, we wanted to make sure that that expectation
11 was, in fact, addressed so that it would be put in the
12 right context. In other words, the change process
13 that Mike just alluded to did need to be followed.
14 There are, I think, 30 some odd performance indicators
15 that are being proposed here in the Phase 1 report,
16 and the data collection requirements do, in fact, add
17 significant burden to licensees. So, licensees do
18 give us a feedback that, hey, if you are going to
19 implement the new program like that, you need to
20 consider cost benefit, and we had not even engaged in
21 terms of cost benefit at that point. So, to some
22 extent, the tone you see there was to try and address
23 the perception that had gone out in industry.
24 DOCTOR KRESS: If you implement this, would
25 you do it on a pilot basis with a number of volunteer

1 plants to start with?

2 MR. BOYCE: We would expect that to be the

3 case, that's what our Manual Chapter 0608 calls for

4 for PIs like this.

5 DOCTOR KRESS: And, to determine whether or

6 not it's useful, then those volunteer plants would

7 have had to been compared with the old program, and

8 would have had to have degraded performance somewhere,

9 otherwise you are proving a negative.

10 I'm not sure, you know, you might go on

11 for years, and years, and years, before you ever come

12 to some conclusion that the new process is useful to

13 you that way.

14 MR. BOYCE: Well, I think you'll see from

15 the report that Steve is going to go over that that's

16 not, in fact, what happened. I think they ran some

17 test data through and found out that there was, in

18 fact, degraded performance that came out for the set

19 of data that they looked at.

20 DOCTOR KRESS: Oh, you looked at highest

21 performance.

22 MR. BOYCE: Well, let me — we are jumping

23 the gun a little bit.

24 DOCTOR KRESS: Okay.

25 MR. BOYCE: We looked at the performance

1 over the '99 time period, basically, '97 through '99
2 time period, which is a time period for which the ROP
3 pilot program and the ROP program already had some
4 data on plants. So, we have looked at that, and we do
5 know that because there are certain areas that we are
6 examining with PIs that the ROP doesn't have PIs that
7 we now have the opportunity to see things that weren't
8 there potentially as indicators in the ROP.
9 We are going to cover some of this stuff
10 when we talk about potential benefits and things of
11 that nature, and the examples you'll see when we ran
12 for the 23 plants that we did run, we do have a fairly
13 broad range of coverage of that.
14 DOCTOR KRESS: Okay.
15 Could you indicate what are the
16 implications – when you say reporting under 50.9, I'm
17 not sure I'm exactly familiar, I have kind of an idea,
18 but exactly what does that mean?
19 MR. BOYCE: 50.9 requires that information
20 submitted to the NRC by the licensees will be
21 submitted under oath and affirmation, and that means
22 when a utility does that, that information, once
23 submitted, can be cited in violations for failure to
24 be accurate. So, when you have that level of rigor
25 applied to data, and the potential for being cited for

1 inaccuracies in that data, that process makes
2 utilities apply more effort to ensure that that same
3 data is correct than they may otherwise have to, and
4 that's one of the data issues we'll get to.
5 DOCTOR KRESS: Okay.
6 MR. BOYCE: And, I'll give you some
7 examples of things when we get to that area, as to how
8 that can be a potential problem.
9 And, the issue from our standpoint is,
10 what level of quality and rigor does the data have to
11 have, and if that quality and rigor is something
12 different from 50.9 then the question is, is, well,
13 why would we have to, or would we have to have data
14 submitted under 50.9. That's an implementation issue
15 that would have to get addressed through the formal
16 process in the ROP change process that Mike and Tom
17 just alluded to.
18 In fact, when the existing ROPs were first
19 being tried, one of the things that happened, in order
20 to make sure they understood what the quality issues
21 were and the difficulties were, was there was, I guess
22 the right word would be, a waiver –
23 DOCTOR KRESS: A discretion.
24 MR. BOYCE: – a discretion on enforcement
25 on those issues, as part of the initial program, to

1 make sure that that wasn't becoming an impediment to
2 testing the program out and understanding what levels
3 of things needed to be done.
4 So, those are all kinds of details of how
5 you would go about doing the implementation, which,
6 quite frankly, we're not really here to discuss
7 exactly how that will happen today. The process would
8 be more like this. We go through public comment, we
9 get ACRS comments on the technical quality of what
10 this program brings, and whether or not it looks like
11 it's beneficial to the ROP, and at that point we would
12 produce our Phase 1 report and NRR at that point would
13 be in a position of saying, do you want to take all of
14 these, some of these, none of these, and try to run
15 them through the ROP change process. And then, once
16 they would go into that process, they would lay out
17 the plans in accordance with that procedure, and get
18 together with the industry and our other external
19 stakeholders, and go through the process.
20 So, it's a little premature to tell you
21 what that all would have in it, or what all the
22 decisions would be made, and how they would all be
23 made, because that's a little bit ahead of where we
24 want to be right now. We want to —
25 DOCTOR KRESS: I'm just trying to

1 understand industry's concern. I guess by extension
2 then, all the EPIX data then could theoretically be
3 subject to the requirements of 50.9.
4 MR. BOYCE: Could be. It's not certain
5 that they would, it's not certain that they would not,
6 that's an implementation issue we have to address, and
7 we have recognized that that was a significant issue
8 when they were doing the unavailability data for the
9 current ROP indicators, and we no reason why that
10 issue wouldn't also be an issue for reliability data,
11 which is what the EPIX data is being used for here.
12 So, we recognize that that's an issue that
13 has to get resolved. Industry recognizes it as an
14 issue, and we all think it's something that has to be
15 taken care of through the ROP change process.
16 CHAIRMAN APOSTOLAKIS: So, the current
17 oversight, revised oversight process, when it does
18 risk-related calculations what models is it using?
19 MR. BOYCE: Well, actually, it's not doing
20 risk calculations in the PIs. The calculations were
21 done initially to establish what the thresholds should
22 be on the PIs.
23 CHAIRMAN APOSTOLAKIS: And, that's it.
24 MR. BOYCE: Now, after that, all they do is
25 calculate the value that's coming in and compare it to

1 the threshold. There's no more risk modeling being
2 done in the ROP to get the current indicators.
3 CHAIRMAN APOSTOLAKIS: But, you are doing
4 the same, aren't you?
5 MR. BOYCE: We are applying the same
6 philosophy here.
7 CHAIRMAN APOSTOLAKIS: Okay, but you are
8 using the SPAR model.
9 MR. BOYCE: We are using plant-specific
10 SPAR models to set thresholds.
11 CHAIRMAN APOSTOLAKIS: What did they use?
12 MR. BOYCE: They used a combination of
13 licensee models, some SPAR model runs that we did for
14 them in the process, and they came to a consensus
15 opinion of how to set thresholds based on those
16 results. And, they tend to be generic for the
17 industry, as opposed to plant specific.
18 And so, that's what was done, and it's
19 documented in 99-007. I can't recall exactly which
20 appendix it's in, but I know it's in there.
21 CHAIRMAN APOSTOLAKIS: It was H, Appendix
22 H.
23 I'm trying to see whether — I mean, the
24 sig — I understand the significance of the first sub-
25 bullet, data quality and availability, the second one

is not so clear to me. Is it because this new effort is intended to be plant specific?

MR. BOYCE: That's right.

CHAIRMAN APOSTOLAKIS: The PRA model is more important than it was in the generic case.

MR. BOYCE: That's right.

You see, the thresholds for individual plants would – could be lowered, and so the plant's margin to the green/white threshold, if we use the same process under the current ROP, could be less. And, any time you are talking about increased regulatory attention licensees are very sensitive to that sort of thing, and so we want to have good quality models so we have confidence in the thresholds and in the information that's being presented to us.

CHAIRMAN APOSTOLAKIS: Right.

And, my counter argument to that is that, this is a good idea to worry about these things if the starting point has some logic to it. And, I don't think that 95th percentile you guys did can withstand scrutiny.

MR. MAYS: Well, George, you'll notice that one of the things –

CHAIRMAN APOSTOLAKIS: The weakness of this method is that it depends only on the number of plants

1 with less than acceptable performance, but not on how
2 much their performance exceeds the norm. Wonderful.
3 MR. MAYS: Well, George, we went back, as
4 part of the RBPI process, as we outlined in the RBPI
5 White Paper, and said we were going to look at how we
6 thought thresholds need to be set, and we went and
7 looked at that particular issue and we, in
8 recommendations in the program, concluded that we
9 thought it made more sense to have the green/white
10 threshold for performance indicators be based on a
11 risk change rather than on a deviation from norm
12 principle. And so, we have made that case that it's
13 more consistent with the significance determination
14 process for inspection findings, which all three color
15 layers are based on a risk metric, and so we are
16 making that recommendation, we provided the
17 information for how we would say what the distribution
18 of plants' performance was, where the 95th percentile
19 was on that, and we've made that recommendation. And,
20 so far, quite frankly, I haven't had any technical
21 comments come back from either inside NRC or outside
22 so far, that said, no, no, no, we want to stay with
23 the 95th. There may be some that will say that, but
24 I think there is a better logical connection for using
25 the green/white interface on PIs based on risk than

1 based on deviation from the norm.

2 CHAIRMAN APOSTOLAKIS: That's right.

3 MR. MAYS: So, I mean, I want to – I think
4 it comes to my mind at this point to recall a
5 principle that Mike and I have talked about long and
6 often, with respect to this and other work, and we
7 have worked by that principle from the beginning, and
8 that's our principle, is progress, not perfection.
9 The idea is, we want to make incremental improvements
10 where we can, and we are not going to worry about the
11 fact that we don't have perfection either in what we
12 started with or what we end up with, because we don't
13 want to end up with what I loosely refer to as the
14 source term problem, where we start out with TID
15 14844, which was several people gathered around the
16 table thinking what they thought best, and then no
17 matter how much subsequent technical analysis gets
18 done, it becomes difficult to change, because the
19 other thing was already there.

20 So, we are trying to say, what we have is
21 what we started with. The ROP is there. I'm not here
22 to say whether the ROP is perfect or not, that's not
23 my job. My job here is to try to address things that
24 could make the ROP better, and that's the tone in
25 which we are trying to do this.

1 MR. JOHNSON: Yes. I would just add to
2 that two years ago we had what we had with respect to
3 the performance indicators, and we picked for targets
4 of opportunity for which we had data, and we set
5 thresholds as best we possibly could, and that
6 included for the green/white threshold that 95
7 percentile breakout for performance indicators.
8 Keep in mind that performance indicators,
9 some of the performance indicators were new, and were
10 in areas where you didn't have – couldn't apply a risk
11 model, for example, the Security Equipment Performance
12 Index PI was a new PI, and there's no way you can risk
13 inform that, if you will.
14 So, but remember, in the broad context of
15 the ROP the green/while threshold is meant to be
16 indicative of an area where we need to go out and do
17 some additional inspection to look. So remember, don't
18 view the performance indicators in a vacuum. They are
19 a piece of an entire program, by which we provide
20 oversight on licensee performance.
21 MR. BOYCE: To try and get us back on
22 track, I was on the last bullet here, and I think
23 we've covered all the points, with the possible
24 exception of the last one, and that is, is that one of
25 the significant comments that we heard early on from

1 industry was, is that the risk-based PI program does
2 represent a large increase in the number of
3 performance indicators. And, any time you increase
4 the number of performance indicators you have the
5 opportunity for an increased opportunity for one of
6 the performance indicators to exceed a threshold.
7 Again, using the green/white threshold, if we go into
8 the white or above regulatory action is mandated under
9 our current ROP. And so, industry's comment was,
10 there's definitely an increased chance to regulatory
11 attention.
12 So, one of the things that we would
13 consider, if we were going to move forward with all of
14 the risk-based PIs, would be to, perhaps, modify the
15 algorithms on our Action Matrix for changing columns
16 from the licensee response column to the regulatory
17 response column, or other columns of the Action
18 Matrix. But, that is not, again, I don't to establish
19 premature expectations, that is not our current plan,
20 and I think Steve is looking at ways to, perhaps,
21 combine the performance indicators, so that there
22 would be fewer numbers, and I think you are going to
23 hear more about that.
24 But, we did want to say that we would
25 consider that sort of approach if necessary.

1 CHAIRMAN APOSTOLAKIS: Well — oh, I'm
2 sorry, go ahead.
3 DOCTOR KRESS: If changing over from one
4 color to another across the threshold represents a
5 delta CDF, for example, then I don't see how — I mean,
6 you have a total delta CDF you don't want to exceed,
7 you know, in your matrix, I don't see how having more
8 PIs changes that. If you set the change for each one
9 of the PIs to be a certain delta CDF or related to it,
10 then it doesn't matter —
11 MR. MAYS: Actually, Tom, I think you are
12 correct, the issue would be, was the change in
13 performance reflected through the PIs or was the
14 change in performance reflected through inspection
15 finding, your point being that if you have had a
16 change in performance it should be reflected in one or
17 the other, and that change is the same regardless of
18 how it got found.
19 DOCTOR KRESS: Yes.
20 MR. MAYS: that's true, but I think it is
21 true also that there is what I would call an optics
22 issue, which is, if you have more direct PIs you have
23 maybe a faster responding optics with respect to the
24 fact that something has changed, and the Action Matrix
25 was set up on the basis of the limited number of PIs

1 that you have. So, the issue here was, the Action
2 Matrix was a little – was defined in light of those
3 numbers of PIs, and so, therefore, it might be
4 something that would have to get looked at.
5 I think it's pretty clear that the more
6 PIs you have, the more opportunities you have to cross
7 a particular threshold, and that was basically the
8 concern that industry raised for us and –
9 DOCTOR KRESS: Well, you know, that's what
10 I viewed as the good part, about adding more PI.
11 MR. MAYS: Well, it's the double-edged
12 sword.
13 DOCTOR KRESS: Right.
14 MR. MAYS: If you have more PIs you have
15 more opportunities to look green, but if you have more
16 PIs there's also another opportunity to have not
17 green, and the question is, how much of a value, I
18 guess, would be more greens as compared to more non-
19 greens, and I can't answer that question.
20 CHAIRMAN APOSTOLAKIS: That's an issue I
21 wanted to raise when I read the report. In Chapter 2
22 of the main report, January, 2001, there are four
23 steps that are listed in the RBPI development, assess
24 the potential risk input of degraded performance,
25 obtain performance data for risk-significant equipment

1 related elements, identify indicators capable of
2 detecting performance changes, and identify
3 performance thresholds consistent and so on.
4 It seems to me there is a major
5 consideration missing here, which is related to this
6 concern that we just discussed. When you come up with
7 a new indicator, shouldn't you be asking at some
8 point, is this information redundant with respect to
9 what I already have?
10 DOCTOR KRESS: That is the key question.
11 CHAIRMAN APOSTOLAKIS: See, you have to
12 constrain the number. If I look at these four and I
13 didn't know any better, because I'm sure you guys
14 thinks about it, but maybe you didn't state it, but if
15 I look at these four it's an open-ended process,
16 because it doesn't, at any moment trying to limit the
17 additional information that I'm getting from the RBPI,
18 and what's worse, at no point do you go back to the
19 baseline inspection and say, well, I've added this
20 performance indicator, therefore, I don't need to do
21 this now in the baseline inspection, and that I think
22 explains the concern from the licensees. All they see
23 is more PIs without anything else changing.
24 MR. BOYCE: I was going to say, you do
25 sound like an industry stakeholder at this point,

1 which explains the tone, perhaps, in that original
2 memo.
3 CHAIRMAN APOSTOLAKIS: But, there should be
4 something to limit the number, though. There should
5 be a tradeoff somewhere.
6 MR. MAYS: George, you're correct, and that
7 process is what the ROP change process is designed to
8 do. Our task from the RBPI development process was to
9 go and determine what was potentially possible to have
10 more direct measurement and indication of as
11 performance indicators for the ROP, in light of the
12 areas that NRR asked us to go look at. And, you are
13 right, this process does not limit the number.
14 However, we recognized, in coming up with
15 the number that we had, that that was a potential
16 issue, and NRR has recognized it, and the industry has
17 recognized it, and I think the judgment as to are more
18 indicators better, and are more indicators of value,
19 is something that the ROP change process has been
20 explicitly designed to try to answer.
21 So, I think that is something that we
22 expect will get dealt with through the ROP change
23 process as NRR looks at what we have technically
24 developed and determines whether or not it makes sense
25 to do.

1 CHAIRMAN APOSTOLAKIS: Could you add a step
2 like that to the –
3 MR. MAYS: My point, George, is, that's
4 their step, that's not our step. Our step is to do
5 the feasibility to see what's technically feasible to
6 do.
7 CHAIRMAN APOSTOLAKIS: Ah, okay.
8 MR. MAYS: Their job is to determine, once
9 we've got that technically feasible product, whether
10 or not it makes additional benefit to the process, and
11 that's what the ROP change process is designed to do.
12 MR. JOHNSON: And, if I can add, I just
13 checked on the way over, George, this morning, and, in
14 fact, the Inspection Manual chapter that provides that
15 change process is Inspection Manual Chapter 0608, and
16 it was issued earlier this week. It's available on
17 the internal web, and it will be available shortly on
18 the external web, and it provides for considerations
19 of the very things that you mentioned, does it add new
20 data, new information, what, in fact, changes ought we
21 be considering with respect to the baseline as a
22 result of those changes.
23 CHAIRMAN APOSTOLAKIS: But, if I look at
24 the beautiful figures that Research has developed,
25 like Figure 2.1, RBPI development process, where the

1 diamonds say do statistics accumulate quickly enough
2 to support timely plant-specific evaluation? Yes/No.
3 Timely quantification. Yes/No. There should be a
4 diamond somewhere there that says is this additional
5 information useful? Yes/No. Has it already been
6 covered? See, it falls naturally there, I think.
7 Now, whether somebody else does it is a different
8 story, but I think this diagram can be the basis for
9 evaluating this additional information, and then
10 addressing the licensee concern, which I think is
11 legitimate the way we are doing it. I mean, we are
12 just adding things.
13 MR. JOHNSON: Yes, I guess the answer we
14 are trying to give you is that those considerations
15 are already built into the process, the change
16 process. It has diamonds with Yes/No and you advance
17 — you don't advance based on the answers to the kinds
18 of questions that you are asking, and we see that.
19 Again, what Steve has said is, Research's effort has
20 been the feasibility study, based on the results of
21 that feasibility study as we go forward and take
22 candidate risk-based PIs, we run them through that
23 process, before implementation we have answered all of
24 those questions.
25 DOCTOR KRESS: George?

1 CHAIRMAN APOSTOLAKIS: Yes. I'm getting a
2 question.
3 DOCTOR KRESS: Unless degraded performance
4 manifests itself as a uniform change across, say,
5 systems and components that are risk significant, so
6 that when you have degraded performance they all
7 degrade to some extent, then I don't see how you can
8 think that there might be redundancy or things covered
9 already, because all they are adding is risk
10 significant components and systems.
11 Now, if they add systems they could be
12 redundancy to components, of course, that would be the
13 only place I would worry about it, but otherwise,
14 unless you are –
15 CHAIRMAN APOSTOLAKIS: For the initiating
16 events what you are saying might be more value.
17 DOCTOR KRESS: – I think it's true for
18 reliability and availability also.
19 CHAIRMAN APOSTOLAKIS: For the mitigating
20 systems, I'm not so sure, but even for the initiating
21 events, it's not just a redundancy of information, but
22 maybe you can consider like – I think they are already
23 doing that, things for which you do have some records,
24 and others that are really so rare that you can't
25 build a – construct a performance indicator, and maybe

1 if you look at this class, for example, you can pick
2 one that would be more or less representative, rather
3 than having all of them. I mean, you can bring
4 additional considerations into this to try to limit
5 the number of —
6 MR. MAYS: George, I think you've been
7 reading the script again. If we can get to the point
8 of the things that we've tried to do to address this
9 issue of the number of indicators, what we've referred
10 to as an alternative approach, I think you are going
11 to see a lot of these questions or issues dealt with.
12 We have looked at things of that nature,
13 and so I'll make the suggestion that maybe we get into
14 the meat of it, and you'll see where that comes out.
15 DOCTOR KRESS: Well, let me ask one other
16 question before we get there, is when you developed
17 your thresholds, for example, your delta CDF related
18 thresholds, you did them one component at a time.
19 Now, somewhere along the line you may end up with a
20 number of these things degrading.
21 MR. MAYS: You're reading the script again.
22 DOCTOR KRESS: Is that in the script
23 somewhere?
24 MR. MAYS: That's in the script.
25 DOCTOR KRESS: Okay, well, I'll just wait.

1 CHAIRMAN APOSTOLAKIS: Is this the last
2 time we are talking about the NRR reaction today?
3 MR. MAYS: Unless something else comes up
4 as we discuss the implementation.
5 CHAIRMAN APOSTOLAKIS: I want to ask a
6 question on the memo. Is that appropriate at this
7 time?
8 MR. MAYS: You can ask anything you'd like,
9 George.
10 CHAIRMAN APOSTOLAKIS: On page 7, there's
11 something I don't understand, but it appears to be
12 related to something that Doctor Kress and I have been
13 discussing over the years, it has to do with shutdown
14 PIs and it says, "Using the current process of
15 comparing time and risk-significant configuration to
16 a year does not seem appropriate for shutdown
17 conditions, since the entire outage may not be a
18 significant time interval compared to a year," 14 days
19 to 365. "As a suggestion ...," this is now what I
20 don't understand, "... perhaps, time spent in the
21 risk-significant condition as a percentage of plant
22 outage time would be a way of quantifying this risk
23 significance." Can you explain that a little bit,
24 what the rationale is, percentage of plant outage
25 time.

1 MR. BOYCE: I'm not sure I can without
2 reading the memo. I can only offer to you that the
3 way that memo has developed, we sent around the Phase
4 1, draft Phase 1 risk-based PI report to several of
5 our technical branches, and we brought comments
6 together in that one memo. So, I cannot recall the
7 specifics of why that particular comment was written
8 the way it was.
9 CHAIRMAN APOSTOLAKIS: And, it says —
10 DOCTOR KRESS: It sure sounds like a bad
11 idea, doesn't it?
12 CHAIRMAN APOSTOLAKIS: Yeah. First of all,
13 I'm trying to understand it. "Using that measure,
14 shorter outages would result in higher risk
15 significance." Now, that — I just — I would like to
16 understand a little better what the rationale for that
17 is, but, I mean, if you can't answer now, you can't
18 answer now.
19 MR. BOYCE: I can't answer it definitively
20 right here.
21 CHAIRMAN APOSTOLAKIS: Is there any way we
22 can find out, Mr. Markley?
23 MR. HAMZEHEE: George, I think in general
24 what they are trying to say is that if you shorten the
25 outage you end up doing a lot of maintenance

activities at the same time, during a short period. As a result, you have more equipment out of service, and if something goes wrong then the availability of your safety systems are limited.

CHAIRMAN APOSTOLAKIS: Yes, but this is a very qualitative statement that, you know, somebody can come back and say, gee, I'm using my PRA, I'm using OREM (phonetic), Sentinel (phonetic), and all these things, and I'm controlling on these things, so how can you, you know, speculate? And also, this becomes more specific, it says, "We can compare the time spent in the risk-significant condition as a percentage of plant outage time," in other words the plant outage time has some magic to it.

MR. MARKLEY: The k heat load would be the primary thing if they go into reduced inventory, even though they have done a lot of maintenance on line.

MR. MAYS: Let me suggest that rather than us speculate, that if you would like to get an answer to that we will try to determine who made the comment and try to get something out to you.

DOCTOR BONACA: Yes, I'd rather differ, as the comparing time and risk-significant configuration to total outage time, in that sense if you are attempting to shrink the whole outage time by, for

1 example, staying a longer time in a risk-significant
2 configuration, okay, versus staying with a longer
3 outage time, total outage, by reducing the time in
4 risk configuration to a shorter time, that's the
5 comparator I see there.
6 MR. MAYS: I read that as a more general
7 concern, quite frankly, George.
8 DOCTOR BONACA: Assume that you have — we
9 are going to go through some configurations, some are
10 riskier than others, and you may find that you may be
11 able to shorten the whole outage by staying a longer
12 time into a risk-significant configuration. Okay?
13 That's the concept, it seems to me.
14 CHAIRMAN APOSTOLAKIS: Perhaps, what we can
15 do is, can we ask NRR to send us a little memo
16 explaining this? Is that —
17 MR. JOHNSON: Yes. I would almost suggest,
18 if we could come over and — I mean, I'm not sure what
19 your schedule is like, but we would certainly — your
20 question is a good one, and we certainly look forward
21 to trying to provide —
22 CHAIRMAN APOSTOLAKIS: No, we can address
23 it at the full committee, you can address it at the
24 full committee meeting. It can be an item to — you
25 have plenty of time until then.

1 MR. JOHNSON: Sure. Sure. When is the
2 full committee scheduled to meet, I'm sorry?
3 MR. MAYS: I believe we're on Friday on the
4 7th.
5 CHAIRMAN APOSTOLAKIS: The first week of
6 May.
7 MR. MAYS: The first week of May, is it the
8 7th?
9 CHAIRMAN APOSTOLAKIS: So, you have two
10 weeks at least.
11 MR. JOHNSON: Yeah, let us come back at
12 that time with an answer to your specific question.
13 CHAIRMAN APOSTOLAKIS: Okay.
14 MR. MAYS: And, George, the way I read that
15 comment was a little less specific than you did. The
16 way I read that comment was as follow, as licensees go
17 to shorter and shorter outage times, a greater
18 percentage of their outage time is spent in high
19 relative to decay heat (phonetic) scenarios, and some
20 percentage of their time is spent more in mid-loop
21 operations, and the concern was, is that constitutes
22 a higher risk situation. And, the concern was whether
23 or not the indicators, as we've proposed in the RBPIs,
24 would be capable of dealing with that particular
25 situation.

1 Now, I think they do. I viewed that as a
2 challenge to me to get back to the commenter and
3 explain to them how these RBPIs will deal with the
4 fact that if they go to shorter and shorter outages,
5 and they involved greater risk scenarios, that these
6 would be capable of detecting them. That was the way
7 I took that comment.
8 And so, I think it's covered, but that's
9 part of the process we'll have to do to get back with
10 the people we've received comments on, as we go
11 through to make the final report.
12 CHAIRMAN APOSTOLAKIS: Okay.
13 DOCTOR KRESS: Certainly, it seems to me
14 like the appropriate thing is just what you've done,
15 and that's time in risk-significant configurations.
16 MR. MAYS: I think it addresses that
17 comment, but it wasn't clear to that person making the
18 comment that it does.
19 DOCTOR KRESS: Yeah, that ought to be the
20 appropriate way to look at it.
21 DOCTOR BONACA: Yes, I think here central
22 is the statement above in the title that says,
23 "Licensees are currently performing so refueling
24 outages are of very short durations," and that's the
25 focus of that. You can be, you know, more capable of

1 going shorter, but —

2 DOCTOR KRESS: That ought to be covered

3 with what they've got.

4 CHAIRMAN APOSTOLAKIS: I understand it

5 qualitatively, but I think this goes beyond that, it

6 actually tells you how to do it, and I'm trying to see

7 what the implications would be to Regulatory Guide

8 1174, because you have been arguing for a long time

9 that it's the average over the year, and these guys

10 seem to be going away from that. So, I'd like to have

11 some further discussion. It's not just in this

12 context, okay, but this is something that has been of

13 concern to Doctor Kress and me for a while now.

14 MR. MAYS: Well, let me suggest that the

15 context that would be most appropriate for you is for

16 us to go back and discuss this with the person who

17 made the comment, and then when we have come up with

18 a solution, present what the solution is to you and if

19 you agree with it then it doesn't matter what the

20 comment was.

21 CHAIRMAN APOSTOLAKIS: That's fine.

22 Okay, so I don't know why Tom took so long

23 to finish just the —

24 MR. BOYCE: I apologize for that.

25 CHAIRMAN APOSTOLAKIS: Apologies accepted.

1 MR. MAYS: Tom has difficulty not talking
2 a lot, and he really is –
3 CHAIRMAN APOSTOLAKIS: So, we'll go back to
4 Steve now.
5 MR. BOYCE: Steve made the comment we
6 shouldn't send him comments.
7 CHAIRMAN APOSTOLAKIS: Okay, Steve.
8 MR. MAYS: Okay.
9 The rest of what we are going to present
10 today is primarily the results of our stuff. Mike and
11 Tom will be sitting over here at the side if there's
12 any other questions.
13 So, what I suggest we do here, if it's all
14 right with you, the first portion of this is
15 discussions of the potential benefits before we get
16 into the summary of the thing, so if you want to do
17 those first and then I didn't know what time you
18 wanted to take your first break. Okay, so let's go
19 through the benefits first.
20 What we have outlined in this report is
21 some of the things that we think are the benefits of
22 RBPIs, and the first one which answers part of the
23 question you raised, George, is why we even want to do
24 this. Well, one of the reasons is, we get a much
25 broader sample of risk performance with this set of

1 indicators than we do with the current ROP, and they
2 are a more objective indication because they are more
3 directly tied to plant-specific performance and with
4 a relationship to the plant-specific thresholds.
5 So, we believe that's a positive, that's
6 one of those progress versus perfection things, that's
7 one of those potential benefits that we think this
8 thing has.
9 Also, years ago, NEI submitted a document,
10 a white paper, to us, NEI 96-04, which was their paper
11 on risk-based and performance-based regulation, and
12 they wanted us to move in the direction where we had,
13 as just quoted here, a regulatory approach that more
14 directly considered operating experience and the risk
15 implications of it, and performance-based process
16 where we had measurables, and objective criteria, and
17 specified reactor — or, specified activities that the
18 NRC would take and flexibility for the licensee as
19 long as they were performing in an appropriate band.
20 Well, I think the ROP process reflects those general
21 principles, and the RBPIs are an example of a more
22 direct approach to applying operating experience and
23 probabilistic safety assessment judgments as to how we
24 would go about doing that.
25 DOCTOR KRESS: Steve, I think the word

1 "sample" within that dot is a really key word.

2 MR. MAYS: That's an important word.

3 DOCTOR KRESS: Because you are not

4 measuring the full performance always, you are taking

5 a sample.

6 MR. MAYS: That's correct.

7 DOCTOR KRESS: And, you are going to infer

8 from that what the full performance is, and I think

9 that's a key concept in this whole thing.

10 MR. MAYS: I agree, that is a key concept.

11 The issue that's part of – built into the Reactor

12 Oversight Process is that the indicators will be a

13 sample of performance, and the inspections will be the

14 process by which we go out and sample the rest of the

15 performance, as it relates to meeting cornerstone

16 objectives. So, again, this is a balance of how much

17 of your sampling you want to spend in the PIs, how

18 much of your sampling do you want to spend in

19 inspection, and remember, a key part of this Reactor

20 Oversight Process is not that the NRC does all of the

21 sampling, it's that the licensees do the sampling,

22 that their problem identification and corrective

23 action programs are the key behind all this, that they

24 are continuously sampling and looking for things, and

25 we have a smaller subset that we look at to provide us

1 with the assurance that they are doing their job
2 right. So, that's an important point, I think, to be
3 raised.
4 In doing the sample with the RBPIs that we
5 proposed, we've got more systems and more components
6 covered by more objective and more risk-informed
7 methods than the current ROP has. And, in the
8 indicator space, we have some indicators that go
9 across system boundaries and across the breadth of the
10 plant, and we believe that's an important piece
11 because one of the issues earlier raised was what
12 about crosscutting issues? Well, what if I have my
13 maintenance program degrading and I just don't happen
14 to see it in my diesel generator or my HPI indicator,
15 how will I know that my plant is getting worse? Well,
16 by having some of these indicators that go across
17 systems, we think that might help address some of
18 those issues from an indicator standpoint. The rest
19 of it has to be addressed through inspection.
20 CHAIRMAN APOSTOLAKIS: But, you are saying,
21 on page A-25, "Currently, there is no established
22 method of identifying changes in operator performance
23 and then feeding this information back into the SPAR
24 models. As a result, equipment performance is the
25 only mitigating system out there that will be

1 evaluated in this analysis." Are you saying there
2 that the crosscutting issue of safety conscious
3 environment, and the corrective action program, cannot
4 have performance indicators, we have to do something
5 else about them?
6 MR. MAYS: I'm saying I don't have anything
7 readily available now to do it. I'm not saying it's
8 impossible to develop it, but I'm saying I don't have
9 that capability right now. The capability I have
10 right now is to reflect whatever operator performance,
11 with respect to safety culture, with respect to
12 maintenance program, as to how they manifest
13 themselves in respect to the availability and
14 reliability of the equipment. So, I can't directly go
15 out right now and measure the safety culture at the
16 plant, but I can go out and measure whether the safety
17 culture of the plant has had an impact on the
18 availability and reliability and the frequency of
19 events.
20 CHAIRMAN APOSTOLAKIS: But, I thought
21 equipment performance was taken as a separate
22 attribute from the human performance. In other words,
23 if it's a valve, and it is left inadvertently closed,
24 would that be part of the indicator for the valve?
25 MR. MAYS: Yes.

1 CHAIRMAN APOSTOLAKIS: Because even though
2 it was not a fault of the valve itself?
3 MR. MAYS: Correct.
4 MR. HAMZEHEE: But, it wasn't available.
5 CHAIRMAN APOSTOLAKIS: Huh?
6 MR. HAMZEHEE: But, it wasn't available.
7 CHAIRMAN APOSTOLAKIS: It was unavailable.
8 MR. HAMZEHEE: It's reflected in the
9 unavailability of that equipment.
10 CHAIRMAN APOSTOLAKIS: And, you will keep
11 track of the fact that it was a human error?
12 MR. HAMZEHEE: The cause would show, yes.
13 MR. MAYS: Well, the RBPIs would not
14 reflect the fact that it was a human error. The basic
15 data that was going into the RBPIs would be available
16 to us, so that if we determined that somebody's
17 performance was requiring additional regulatory
18 attention, we could go back and look at the
19 information and say what was causing this to be a
20 problem, and then use that as part of our guidance for
21 how we go and look at the plant.
22 The issue that we were raising in that
23 particular point was that we don't have direct human
24 performance measures that we are going to have
25 indicators for.

1 CHAIRMAN APOSTOLAKIS: So, these then
2 crosscutting issues should be part of the baseline
3 inspection.
4 MR. MAYS: They are.
5 CHAIRMAN APOSTOLAKIS: Okay.
6 MR. MAYS: And, this would be a case where
7 we would have more direct objective indicators of some
8 of the impacts of that.
9 CHAIRMAN APOSTOLAKIS: I thought they were
10 not.
11 DOCTOR KRESS: I didn't think they were.
12 MR. MAYS: Well, the crosscutting issues –
13 no, the crosscutting issues are dealt with in the ROP
14 through the problem identification and resolution
15 inspections, to determine whether or not the plant has
16 an appropriate process by which they can manage those
17 kinds of issues.
18 CHAIRMAN APOSTOLAKIS: Well, is that true,
19 Mike? I don't remember. Oh, it's not that he's
20 lying, but –
21 MR. JOHNSON: I'm sure it was true,
22 although I've got to confess I was talking. I didn't
23 hear the total comment.
24 MR. MAYS: The additional benefits that we
25 alluded to earlier has to do with the fact that we

1 have a better understanding of plant-specific
2 implications using these than we necessarily had with
3 the current ROP. Our thresholds are set on the basis
4 of plant-specific models. We don't average diverse
5 systems together, which can potentially mask the
6 contribution. For example, in the ROP, the turbine-
7 drive pump trains and the motor-drive pump trains are
8 AFW, their unavailability is averaged, and that's the
9 value that's used in the PI. Well, turbine or diesel-
10 driven pumps have different risk significance than
11 motor-driven pumps because of the station blackout
12 risk issue, and so the RBPIs that we proposed allow us
13 to deal with that.
14 The other thing that I think has come up
15 on a couple of occasions in the current ROP that has
16 been dealt with in the RBPIs is whether the failures
17 affecting the reliability and availability indicator
18 that you might have, whether they are based on the
19 risk-significant functions or whether they are based
20 on design basis functions. The example that comes to
21 mind was the, I believe it was Quad Cities had a case
22 where they ran their once a cycle test of their HPCI
23 system to see it it would automatically actuate, and,
24 in fact, it wouldn't. There was a problem with the
25 automatic circuitry to start the HCPI system.

1 Now, over the period of the cycle, they
2 had been manually starting the system every month or
3 quarter or something like that, and it was working
4 just fine. So, what happened was, they determined
5 that they had a problem with the automatic feature for
6 this system, and the fact that they had not tested it
7 since the last outage meant that they had nine months
8 of fault exposure time to put into the indicator.
9 Well, that indicator had nine months of fault exposure
10 time, which only represents that it wouldn't have
11 performed its automatic start capability, while it's
12 manual capability was not degraded at all.
13 And, from a risk perspective, having the
14 manual ability to start HPCI is success, so one of the
15 things we've done in the RBPI program is to deal with
16 the difference between auto and manual and design-
17 basis requirements versus risk-significant
18 requirements for the equipment to operate.
19 We've also had a different way of treating
20 fault exposure time than was in the current ROP, which
21 we believe is more consistently accounted for and is
22 more consistent with the way risk assessments are
23 done. The issue there having to do with the fact that
24 in the current ROP there are no reliability indicators
25 per se. Fault exposure time was included in the

1 availability indicator as a sort of surrogate for
2 having a reliability indicator, and because of the
3 relatively short time period under which the
4 availability is gathered, and the fact that the fault
5 exposure time every time you do have one of these
6 failures can be fairly long depending on its nature,
7 you have a false positive/false negative problem which
8 goes back to the old thing that Hal Lewis always
9 talked about, trigger values. The RBPIs don't have
10 that same problem because we classify the failures as
11 either demand-related failures or not, and for those
12 we use a probability calculation and distribution for
13 reliability rather than use the fault exposure time.
14 For fault exposure times associated with discovered
15 events, for which there was no demand, those go into
16 the unavailability in the RBPIs. So, we have a more
17 consistent way of dealing with that, which we believe
18 tends to reduce the problems that were currently being
19 experienced in the RBPIs or in the oversight process
20 with fault exposure time.
21 DOCTOR KRESS: When you determine
22 unavailability, is it true that you count into that
23 unavailability time the time spent testing a piece of
24 equipment?
25 MR. MAYS: If it's out of service and not

capable of being used while that test is going on, yes.

DOCTOR KRESS: I personally think that's a mistake to do that, but we can discuss it later. It does a lot of — it has a lot of negative aspects to counting that in there, one of which is, when they do this testing, they are on a higher alert and the operator error in doing some compensatory measure is probably much less than it would be, so the risk is not the same as it would be if it were just unavailable because it was not functioning correctly.

And, not only that, it gives a negative incentive to not test as often.

MR. MAYS: Well, only if you are doing a lot of testing to the point where it might reach a threshold to contribute to your —

DOCTOR KRESS: Of course —

MR. MAYS: — this is the classic issue from the maintenance rule.

DOCTOR KRESS: — I'm being too general with this, but then —

MR. MAYS: This is the classic issue from the maintenance rule, the balance between the time you spend in testing and maintenance and the impact on reliability and risk. So, that's a problem, I haven't

1 resolved that problem, I'm just trying to be
2 consistent with the current approach.
3 Additional benefits that we have, this
4 process was designed so that the RBPIs would look
5 similar to the current performance indicators, that we
6 would have similar color scheme, they'd be amenable to
7 similar kind of presentations on the web site, and
8 they could be updated in a similar fashion that the
9 current process has.
10 One of the things we've also noted is that
11 these don't have to be implemented, it's not an all or
12 nothing deal. In other words, portions of these can
13 be implemented, some of them can come along later as
14 data, and availability, and quality become better, so
15 this is not an all or nothing deal.
16 DOCTOR KRESS: The nice thing about these
17 performance indicators that you have now is, you could
18 actually calculate a delta CDF. You could take the
19 set of performance indicators at some time and stick
20 them in a plant-specific model and get a delta CDF.
21 MR. MAYS: You are reading the script
22 again, Tom. That's correct. One of the things we had
23 as part of the Phase 2 work that we had originally
24 proposed was to look at how we might develop an
25 integrated indicator.

1 DOCTOR KRESS: That could be the integrated
2 indicator.
3 MR. MAYS: So, that's part of what you are
4 going to see a little bit later on.
5 You were correct in stating earlier that
6 all of the indicators we have now in the report, and
7 the current Reactor Oversight Process indicators, are
8 all basically single variate sensitivity analysis on
9 a larger model.
10 DOCTOR KRESS: Right, but you could take
11 the whole shebang and put it in and calculate it.
12 MR. MAYS: The issue then is, are there
13 synergies among these things that would make them go
14 up, down, or sideways, if you had a more integrated
15 look. We'll talk some more about that as we get
16 further in.
17 The other thing I wanted to mention,
18 because this became a point of confusion with people
19 both internally and externally, that the RBPIs, while
20 we went back and did a lot of work looking at
21 statistical methods to determine what's the right time
22 intervals, what's the right method of calculating
23 these things, and what's the process for setting the
24 thresholds, that this isn't something dramatically
25 exotic. We are using off-the-shelf, readily-available

models. The analysis routines that we are planning to use are fairly simple, and most of the data we've got is from readily-available current databases, there's not, with a couple exceptions, any new information that really needs to be required to make this happen. So, most of the stuff is fairly easy to get and to use.

So, we can get into some of the results now. We talked about the four elements, George brought them up earlier, about how we were going about doing that. We wanted to look for areas where there would be risk impact of performance if the plant was degraded, find out if we could get data on that information, make sure that if we did that we could — the tech changes in a timely manner, and then be consistent with the 99-007 general rule process.

Now, what that means in a practical sense is that, in order to do that you have to have three things. You have to have a model that reasonably reflects the risk at the plant. Now, the word I want you to concentrate on there is reasonably. We were talking about the progress, not the detection mode before, what we have to have is a model that has some fidelity to the risk at the plant, in order for us to believe that we have something that goes on, is real.

1 Then we have to have some baseline performance to put
2 in that model in order to be able to say, this is our
3 starting point, and then we can vary the model off of
4 the baseline to determine what the impact is of
5 changes in the performance.
6 And, the last thing you have to have in
7 order to be successful at doing this is, you have to
8 have an ongoing source of performance data for
9 assessing the plant-specific performance. And, what
10 you'll see as we go through the rest of these is,
11 there were some cases where we had all three of those
12 things and we've made proposals, and some cases where
13 we didn't have them, and so, therefore, we weren't
14 able to do performance indicators on those areas.
15 CHAIRMAN APOSTOLAKIS: Should we take a
16 break now?
17 MR. MAYS: Sure, if you want to take a
18 break now, that's no problem.
19 CHAIRMAN APOSTOLAKIS: Until 10:00.
20 (Whereupon, at 9:44 a.m., a recess until
21 10:00 a.m.)
22 CHAIRMAN APOSTOLAKIS: Back into session.
23 Mr. Mays, continue, please.
24 MR. MAYS: Okay.
25 The first thing we are going to talk about

1 from the results of the RBPIs is the work we did in
2 the initiating event cornerstone, which was for full
3 power internal events. We used three data sources for
4 putting this stuff together, new Reg 5750, which was
5 the initiating event report which we did a couple
6 years ago and you've seen. We used the Sequence
7 Coding and Search System, which has the LER
8 information, which is the source of information about
9 plant trips, and the Monthly Operating Reports, which
10 gives us the critical hours information for the
11 plants. All those sources, by the way, are publicly
12 available, there's no issues with respect to
13 availability and quality of that stuff as far as
14 implementation goes.
15 So, we went back and in going through the
16 process we just discussed we determined that there was
17 three RBPIs we could do for each plant, and the tables
18 are listed as to where they can be found in the main
19 report and the appendices. The important part about
20 here was how we came up with the calculations of the
21 frequencies. Now, the current ROP merely counts the
22 number of SCRAMS you have and goes on from there. We
23 were looking more at the classical PRA definition of
24 establishing a frequency which has distribution
25 associated with it, and so we were looking to see what

1 we could do in terms of prior distributions for
2 figuring these out, and we had three options that we
3 pursued.
4 One was to start with, basically, a non-
5 informative prior, kind of a classical statistical
6 approach, how many failures did you have in how many
7 years, and that's your estimate.
8 The next thing we looked at was taking an
9 industry prior, which would be to say you would take
10 the distribution of the industry population and update
11 that with the plant-specific information.
12 CHAIRMAN APOSTOLAKIS: Can you tell me,
13 Steve, where you did all this stuff?
14 MR. MAYS: It's in Appendix A, I believe.
15 CHAIRMAN APOSTOLAKIS: Appendix A, I don't
16 recall seeing prior distributions. Maybe I missed it.
17 MR. MAYS: Just a second, let me find it.
18 MR. HAMZEHEE: Steve, Appendix F.
19 MR. MAYS: F?
20 MR. HAMZEHEE: Statistical Methods and
21 Results, yes.
22 CHAIRMAN APOSTOLAKIS: Oh, F.
23 MR. HAMZEHEE: Yes.
24 CHAIRMAN APOSTOLAKIS: Okay, thanks.
25 MR. MAYS: So, and then the last one we

1 tried was one that you've seen before in reports that
2 we've given you on system and other studies on
3 constrained, non-informative prior.
4 CHAIRMAN APOSTOLAKIS: So, this appendix
5 will tell me how the choice of the interval
6 observation was made?
7 MR. MAYS: Yes, right.
8 CHAIRMAN APOSTOLAKIS: So, what is it,
9 between one and five years?
10 MR. MAYS: Well, that's the next bullet
11 down. Let me explain what we were doing. We tried
12 three different priors to see which one would give us
13 the best performance that we were looking for, in
14 terms of being able to give us timely indication, not
15 give us too many false positives or false negatives,
16 and to be amenable to being done with the ROP process.
17 So, as it turns out, we were looking at
18 the time intervals. What we wanted to do is take the
19 shortest time interval that would give us indication
20 of performance degradations for which we wouldn't have
21 a false positive or false negative rate that was
22 excessive. And, by a false positive rate, what I mean
23 is that there would be a significant chance that
24 performance hadn't degraded, but the way you calculate
25 it it would send you over the threshold.

1 Then, the false negative would be the
2 situation where if you had a significant degradation
3 in your performance that you would go over the period
4 of time that you were looking and wouldn't have enough
5 data collected to see the changes that occurred. So,
6 that's the simple basis of what we did.
7 So, when we looked at that for the
8 initiating events, we used one year as the time
9 interval for the category referred to as general
10 transients, that's trips, the plant trips, but the
11 safety systems needed for decay heat removal, for
12 activity control, that kind of thing, are not affected
13 by the trip itself, and we also came up with three
14 year intervals for loss of feedwater and loss of heat
15 sink events, which are trips that are a little more
16 complicated and the ability to remove decay heat is
17 impacted directly by the trip itself.
18 For other risk-significant initiators that
19 you typically find in PRAs, like losses of off-site
20 power, steam generator tube ruptures, small LOCAs and
21 other initiators, the problem we had there was that
22 the frequency of occurrence on a plant-specific basis
23 of those things was so infrequent that over a — you'd
24 have to take more than a five-year period to be able
25 to even see that, and that didn't seem to be

1 consistent with the ROP philosophy, which was to go
2 back every year and see where the performance was
3 going so that we could see what we needed to do more
4 of with respect to those indicators.
5 CHAIRMAN APOSTOLAKIS: Well, that's a very
6 important point, though, and I must say that I haven't
7 really read Appendix F in detail, but I was doing my
8 own calculations and I used as an example Table A.1.4-
9 2C plant, two initiating event threshold summary. It
10 seems to me that the results of the aleatory part, the
11 randomness issue that we have addressed here, which is
12 something that the quality control people do, so we
13 have two thresholds here. One is green/white, which
14 is .8, right?
15 MR. MAYS: Which page are you on there,
16 George?
17 CHAIRMAN APOSTOLAKIS: A-17, it's just
18 numbers on here, but A-17. So, we have the
19 green/white 8E-1, right, and the baseline was 6.8E-2,
20 right, the same table?
21 MR. MAYS: Yeah, why don't you just flip to
22 the next page in your presentation, that particular
23 chart is right here.
24 CHAIRMAN APOSTOLAKIS: Okay, fine, but if
25 — the question is now, how long should the interval

1 be, so that the calculation of the rate will be
2 meaningful, and I would have some sort of conclusion
3 that I'm near the baseline or the white region, and
4 for the numbers here I calculated that to be about ten
5 years, which is really too long, as you just pointed
6 out.
7 And, the problem is this, that because
8 these numbers are very low, if you see nothing, that
9 doesn't necessarily mean you are near the baseline,
10 you could be near the – you could be in the white,
11 because it's .8. If your observation is one year –
12 MR. MAYS: Well, in this case, loss of
13 feedwater is three years.
14 CHAIRMAN APOSTOLAKIS: Okay, the three
15 years I think we are beginning now to be a little
16 better, but I think the analysis – maybe I should send
17 you a little memo with what I did so you can tell me
18 what I did wrong.
19 MR. MAYS: No problem. The transient
20 initiator we used one year, loss of feedwater, loss of
21 heat sink we used three years.
22 CHAIRMAN APOSTOLAKIS: It's three years,
23 yeah.
24 MR. MAYS: And, when we got to that point,
25 you still have the possibility, because this is a

1 distribution, we are calculating a frequency and it
2 has distribution, but we are comparing the mean of
3 that distribution to a specific value for the
4 threshold. So, there's always the possibility of
5 false positive/false negative with that.
6 CHAIRMAN APOSTOLAKIS: What's new here, I
7 think, not new, but in PRAs typically we deal with
8 systemic uncertainty, the uncertainty, failures rates
9 and the initiating event frequency. Here you have to
10 worry about the aleatory part, too, because you are
11 talking about real occurrences. So, the fact that
12 they have seen none in the last two years is that due
13 to chance, and my rate of occurrence is, in fact,
14 high, but I just happened not to see it, or is it
15 because the rate is low, and that's the key question
16 that the quality control people are asking.
17 MR. MAYS: Right, and what we've done there
18 is, we've asked a slightly different question. We
19 didn't ask the question, is the mean what we are
20 calculating here, the "correct mean." What we are
21 saying in this situation is, if there was substantial
22 degraded performance, is a three-year period enough so
23 that we would be able to detect that it wasn't green
24 anymore, and the answer to that question is yes.
25 Now, the –

1 CHAIRMAN APOSTOLAKIS: With a certain
2 confidence, though.
3 MR. MAYS: Right.
4 The other side of that coin is, okay,
5 suppose I do have a few events in a one, or two, or
6 three year period, does that necessarily mean that my
7 frequency has, you know, gone up.
8 CHAIRMAN APOSTOLAKIS: Yes.
9 MR. MAYS: And, what I'm saying is, the way
10 we've dealt with that is that we've dealt with that
11 issue, the problem I think you may be looking at is
12 the classical issue is, if my frequency is around .07
13 or so, then in three years can I get enough faults
14 where X over three years tells me something. That's
15 the problem you get when you use the classical
16 approach. What we've done instead is, we've said the
17 industry average is this number, .068, we used a
18 constrained non-informative prior, and we've used a
19 Bayesian update of that to get the new distribution.
20 So, what we don't have is, we don't have the same
21 amount of problems with either the inability to detect
22 changes with the classical approach from a false
23 negative standpoint, or a positive standpoint, and we
24 don't get the false negative problem we have when you
25 use the industry prior by itself, which means that you

1 have to have an awful lot of data at the plant to
2 overwhelm the industry prior.
3 So, the constrained non-informative prior
4 seems to be the middle ground between those two
5 extremes that works best, and that's what we chose to
6 use because it had the lower – it had the performance
7 characteristics because it's a competing interest.
8 False positives and false negatives are competing
9 interests, so that's the way we did that.
10 MR. HAMZEHEE: I think, George, maybe when
11 you were doing your calculation you did not use any
12 prior distribution.
13 CHAIRMAN APOSTOLAKIS: I didn't.
14 MR. HAMZEHEE: That's the reason.
15 MR. MAYS: That's the classical approach.
16 MR. HAMZEHEE: So, you just used a direct
17 number and you get ten or 20 years sometimes to get a
18 reasonable number.
19 MR. MAYS: Right.
20 CHAIRMAN APOSTOLAKIS: Well, actually, for
21 the one standard deviation the interval is only 2-1/2,
22 so it's not bad, 2-1/2 years, it's reasonable.
23 MR. MAYS: Yes, as it turns out –
24 CHAIRMAN APOSTOLAKIS: But, still, though,
25 there is a – I mean, it's only one standard deviation,

1 so the probability that I'm wrong is not negligible.
2 MR. HAMZEHEE: Oh, yeah.
3 CHAIRMAN APOSTOLAKIS: But, I'm going to
4 read Appendix F, so at the full committee meeting
5 we'll have a more meaningful discussion.
6 DOCTOR KRESS: What is your rationale,
7 justification, for using the industry distribution as
8 your prior?
9 CHAIRMAN APOSTOLAKIS: Yeah.
10 DOCTOR KRESS: Do you think that really has
11 the technical justification?
12 MR. MAYS: I think it does have a technical
13 justification. The issue there becomes one of – and
14 this is a standard PRA issue that goes on – you have
15 a limited number of – a limited amount of data at any
16 one particular plant, and you have to go a long time
17 to collect data only at that plant. And, the example
18 I use for people is, go to Atlantic City, do I need to
19 go to every table on the roulette thing at every place
20 in Atlantic City and take infinite data on each one to
21 know something about their performance, or can I take
22 some data over a group and then go back to any
23 particular table and monitor its performance relative
24 to the group to see if it's different, and that's
25 basically the approach that we're taking here.

1 There's a ceratin amount of time that you
2 can take your sample for, to get enough information to
3 do what you need to do.
4 DOCTOR KRESS: I understand that
5 constraint, but I still don't believe —
6 CHAIRMAN APOSTOLAKIS: I guess the
7 rationale is, my plant could be any one of these,
8 okay, and the plant-to-plant variability gives me the
9 fraction of plants that have this particular value.
10 It could be any one.
11 DOCTOR KRESS: Your assumption, though, is
12 that that distribution basically applies to the
13 distribution at that plant.
14 CHAIRMAN APOSTOLAKIS: Yeah, that it's one
15 of those.
16 MR. MAYS: No, not quite, Tom. If you go
17 out and you were to calculate, like we did in new Reg
18 5750, what the frequency was for either PWRs, or BWRs,
19 or the population of plants, when we did that
20 calculation we put a distribution on that that
21 represented the plant-to-plant variability in the
22 population. What we are using here is not that
23 distribution itself, that would be the industry prior
24 distribution, and that tends to give you a problem in
25 that you can have significant degradation and it takes

1 you a long time for your plant-specific performance to
2 overwhelm that initial prior.
3 What we did instead was, we took that
4 industry distribution, we took the mean out of that
5 distribution, and then we constructed a constrained
6 non-informative prior where we diffused the
7 distribution, so that what you see when you do the
8 update is the impact more of the plant performance
9 than of the industry performance, and that helps us
10 resolve, I think, the issue you are talking about.
11 DOCTOR KRESS: Yes, I think that would
12 help. I still think there's a problem with choosing
13 that mean also. I'll have to read it a little more
14 closely.
15 MR. MAYS: We checked in the — if you'll
16 recall, the 5750 to determine whether or not we were
17 seeing plant-to-plant variability on those things, and
18 so there's a means of being able to deal with that.
19 DOCTOR KRESS: Well, you know, eventually,
20 though, you keep updating and the problem will go
21 away.
22 MR. MAYS: Correct.
23 DOCTOR KRESS: Eventually.
24 MR. MAYS: Given enough time.
25 DOCTOR KRESS: Given enough time, yeah.

1 MR. MAYS: So, that's what I was going to
2 do next, was turn to this page here with —
3 CHAIRMAN APOSTOLAKIS: And, this 95th
4 percentile column is explained somewhere in the
5 appendices?
6 MR. MAYS: Yes, that's what the value for
7 the threshold would be if you took the industry prior
8 and —
9 CHAIRMAN APOSTOLAKIS: Oh.
10 MR. MAYS: — set the 95th percentile on
11 there.
12 DOCTOR KRESS: Just like they did in the
13 original ROP.
14 CHAIRMAN APOSTOLAKIS: So, the green/white
15 is on the second table .8, and the industry average
16 95th percentile would be .2, am I correct?
17 MR. MAYS: Correct.
18 CHAIRMAN APOSTOLAKIS: The industry would
19 be .2, 18, so it's higher?
20 MR. MAYS: In some cases.
21 CHAIRMAN APOSTOLAKIS: Plant-specific is
22 higher?
23 MR. MAYS: In some cases, in some cases
24 it's higher, and in some cases it's significantly
25 lower. It depends on how you go. There were examples

where that would happen, less so with the initiating events, but more so with the availability and reliability situation.

CHAIRMAN APOSTOLAKIS: It should be lower, though, should it not, as a rule?

MR. HAMZEHEE: Well, usually yes, because you are talking about 95 percent.

MR. MAYS: Just a second, George, I think we may be making a difference. The value in the 95th percentile column is the value that corresponds to the 95th percentile of the distribution.

CHAIRMAN APOSTOLAKIS: The industry.

MR. MAYS: Of the industry.

CHAIRMAN APOSTOLAKIS: So, that should be higher than 95 percent of the plants, right?

MR. MAYS: Correct.

CHAIRMAN APOSTOLAKIS: Right.

MR. MAYS: Now, what we are saying is, for this particular plant, and remember the baseline was .07, the 95th percentile in this case was .2.

CHAIRMAN APOSTOLAKIS: Uh-huh.

MR. MAYS: All right. We are saying that the risk contribution from changing from .68 to .8 gives us the delta risk increment, whereas the 95th percentile just tells you how much it varied among the

1 plants.

2 CHAIRMAN APOSTOLAKIS: Oh, oh.

3 MR. MAYS: There's no direct relationship

4 between those two. We were showing where you might

5 set the threshold if you used the 95th percentile

6 approach, which is deviation from normal performance,

7 versus a risk threshold approach.

8 CHAIRMAN APOSTOLAKIS: So, what they should

9 really be comparing is the first two columns, and

10 there the baseline is lower.

11 MR. MAYS: Correct.

12 CHAIRMAN APOSTOLAKIS: Okay.

13 MR. MAYS: And, what we found was, is that

14 sometimes, in certain cases, as we tried to apply this

15 concept uniformly through the plants, sometimes you

16 would find cases where you wouldn't exceed the

17 green/white threshold until you were already up in the

18 yellow.

19 CHAIRMAN APOSTOLAKIS: Yes.

20 MR. MAYS: And, we said, that doesn't seem

21 to be a smart thing for us to do.

22 CHAIRMAN APOSTOLAKIS: So, how many plants

23 do you expect to see with 67 transients a year?

24 MR. MAYS: None.

25 MR. HAMZEHEE: That's just a number.

1 MR. MAYS: None, the point is, and this
2 goes back to Tom's earlier point, what we have
3 basically here –
4 MR. HAMZEHEE: That was mine.
5 MR. MAYS: – or your point, or whatever,
6 is that you have a single point variance analysis.
7 Now, what that tells you is that if everything else in
8 the plant were to stay the same, except for this
9 input, how high would it have to go to get me to an
10 increase in core damage frequency of E-4.
11 DOCTOR KRESS: But, you are never going to
12 see that. If you get that bad –
13 MR. MAYS: The realities of – I think
14 everybody will agree the realities are that other
15 things will go wrong before you get to that point, and
16 we'll find something and be able to deal with it
17 before it gets there.
18 CHAIRMAN APOSTOLAKIS: In other words, if
19 I go to the Action Matrix I will see enough whites and
20 greens, whites, way before I see any reds, unless it's
21 some sort of a major disaster.
22 MR. MAYS: Well, you know, I'm saying, I'm
23 not sure how anybody engineering-wise would be able to
24 trip their plant ten or 15 times a year without having
25 other problems in the plant that would manifest

1 themselves, too.

2 CHAIRMAN APOSTOLAKIS: Without having the

3 NRC —

4 DOCTOR KRESS: That's one reason I question

5 the usefulness of that whole problem.

6 MR. MAYS: And, I understand that, that's

7 always going to be the case when you have, risk is a

8 function of multiple variables.

9 DOCTOR KRESS: Yes, absolutely.

10 MR. MAYS: And, if you have indicators that

11 are single variable sensitivity analysis, you always

12 have the issue of, is it realistic that this is the

13 only thing that will change?

14 CHAIRMAN APOSTOLAKIS: Wait a minute, now.

15 Isn't that dependent also on the baseline core damage

16 frequency?

17 MR. MAYS: Absolutely.

18 CHAIRMAN APOSTOLAKIS: For plants that are

19 already — I mean, 19 units that are above, then you

20 shouldn't expect 67 to be in the red.

21 DOCTOR KRESS: No, you might —

22 CHAIRMAN APOSTOLAKIS: In fact —

23 DOCTOR KRESS: — yeah, but —

24 CHAIRMAN APOSTOLAKIS: — as it should be.

25 DOCTOR KRESS: — the question is, I'm not

1 sure where you see that reflected in the thresholds,
2 because the thresholds don't use the absolute value in
3 them. That's another thing that bothers me.
4 MR. HAMZEHEE: No, they use the impact on
5 the CDF.
6 MR. MAYS: Right.
7 DOCTOR KRESS: It's the delta, they just
8 use the delta.
9 MR. HAMZEHEE: Based on the delta CDF, you
10 set the value.
11 CHAIRMAN APOSTOLAKIS: Yeah, but if you are
12 already high.
13 DOCTOR KRESS: It doesn't matter.
14 CHAIRMAN APOSTOLAKIS: It doesn't matter?
15 MR. MAYS: Not quite.
16 DOCTOR KRESS: And, that bothers me a
17 little bit.
18 MR. HAMZEHEE: Well, but it shows the
19 importance of that.
20 MR. MAYS: Not quite.
21 CHAIRMAN APOSTOLAKIS: It does not, do you
22 agree with that?
23 MR. MAYS: Not quite. It depends on all
24 the other things that are in the model together. This
25 is the issue we are raising in the first place. You

1 have some baseline core damage frequency, depending on
2 the model of your plant.
3 DOCTOR KRESS: Yes.
4 MR. MAYS: And, depending on that, and the
5 relationship between the initiator frequency or the
6 diesel generator reliability, or whatever else is in
7 your model, you can vary that, and if you start at a
8 lower baseline you have to have greater changes in
9 order to get to a E-4 delta CDF. However, if you start
10 with a E-4 delta CDF you still have to have a certain
11 amount of change to go to 2E-4, which is what this
12 threshold would be measuring. So, this threshold
13 measures change in the CDF of the plant, it does not
14 measure directly the total absolute CDF. You can go
15 back and figure it out if you wanted to, but that's
16 another issue for the integrated indicator, which was
17 the thing we talked about before.
18 MR. HAMZEHEE: It also shows for that
19 specific plant that general transient by itself is not
20 very risk significant. In other words, you are never
21 going to change your CDF by greater than 1^{-4} unless
22 you go above 67 trips per year.
23 MR. MAYS: Yeah, that's the other thing it
24 tells you.
25 DOCTOR KRESS: Yes, and that's a

1 significant piece, an incite, I think. But, you know,
2 we are speaking in general when we talk about it, even
3 the other PIs, not just this one, that it seems like
4 the absolute value ought to be reflected in there
5 somewhere, and I don't think it really is.
6 CHAIRMAN APOSTOLAKIS: Somehow.
7 MR. MAYS: We chose as part of the ROP
8 philosophy that what we were going to do was, we
9 started with the basic assumption that the design and
10 operation of the plants was basically safe, and then
11 our job was to be able to detect changes in
12 performance in the plants that might be more risk
13 significant, so that we could engage them. So, that
14 philosophy is what determines this.
15 DOCTOR KRESS: Yeah, but you can turn that
16 around a little bit.
17 CHAIRMAN APOSTOLAKIS: That's a very good
18 point, actually.
19 DOCTOR KRESS: Yeah, but you can turn it
20 around and say there are some plants that are not just
21 basically safe, but, really, really good risk status.
22 CHAIRMAN APOSTOLAKIS: So, you are
23 penalizing those.
24 DOCTOR KRESS: And, you are penalizing
25 those.

1 MR. MAYS: No, actually, we are not,
2 because we are saying they have to demonstrate that
3 their change in performance is significant before we
4 go to them, and we're saying, what's the definition of
5 significant, it's consistent with the existing
6 philosophy, you've increased your change by a certain
7 amount.
8 DOCTOR KRESS: Yeah, but you could allow
9 those plants to degrade their performance without
10 worrying so much about it.
11 MR. MAYS: We're taking the same absolute
12 change in performance for all the plants.
13 DOCTOR KRESS: I understand.
14 CHAIRMAN APOSTOLAKIS: I think you made a
15 good point, Steve, but maybe we ought to think a
16 little more about Tom's point, too, but I think your
17 point is well taken.
18 DOCTOR KRESS: Yes, I think it's not a bad
19 point, I'm not totally disagreeing with you.
20 CHAIRMAN APOSTOLAKIS: But, here is the
21 place where I think we can revisit the question of
22 putting constraints on the proliferation of the number
23 of RBPIs. You state in the report that the loss of
24 feedwater and loss of heat sink are performance
25 indicators that are not in the existing Revised

1 Oversight Process, and they just talk about
2 transients.
3 MR. MAYS: Well, actually, they have two.
4 They have —
5 CHAIRMAN APOSTOLAKIS: Unplanned SCRAMs.
6 MR. MAYS: — they have three in the
7 initiating event cornerstone, they have unplanned
8 SCRAMs, which is just a count of all the SCRAMs.
9 CHAIRMAN APOSTOLAKIS: Yeah.
10 MR. MAYS: They have the number of —
11 CHAIRMAN APOSTOLAKIS: Significant power
12 changes.
13 MR. MAYS: — power changes, and they have
14 one that kind of represents feedwater and heat sink
15 combined.
16 CHAIRMAN APOSTOLAKIS: Right.
17 MR. MAYS: So, this one is —
18 CHAIRMAN APOSTOLAKIS: But, the question
19 is, I think this is where we could ask the question,
20 is it worth treating them separately, so that the
21 number of performance indicators increases to the
22 dismay of the industry?
23 MR. MAYS: Actually, in this case the
24 number wouldn't change.
25 CHAIRMAN APOSTOLAKIS: But, why?

1 MR. MAYS: If you had three, you would have
2 three, so there wouldn't be any net change if you were
3 to make a complete swap out.
4 CHAIRMAN APOSTOLAKIS: In terms of
5 collecting data, it wouldn't make any difference, I
6 agree.
7 MR. MAYS: No, and it wouldn't make any
8 difference if –
9 CHAIRMAN APOSTOLAKIS: But, in terms of
10 having more indicators it really does make a
11 difference. You have three now, they had only two.
12 MR. MAYS: They had three.
13 MR. HAMZEHEE: They have unplanned SCRAMs,
14 loss of normal heat removal pump and reactor power
15 changes.
16 CHAIRMAN APOSTOLAKIS: Where would you put
17 the unplanned SCRAMs, in general transient?
18 MR. HAMZEHEE: Yes, usually.
19 MR. MAYS: We would substitute general
20 transients for unplanned SCRAMs.
21 CHAIRMAN APOSTOLAKIS: Significant changes
22 in power?
23 MR. MAYS: We wouldn't use those because we
24 can't make a relationship between risk in that.
25 CHAIRMAN APOSTOLAKIS: So, in this

1 particular case you would preserve the number.

2 MR. MAYS: Well, that would be a decision

3 for NRR to say whether they were going to preserve it

4 or not preserve it.

5 CHAIRMAN APOSTOLAKIS: No, I understand

6 that, no, but let's not avoid the thing. I want to

7 get into the question of whether loss of feedwater and

8 heat sink, how can we scrutinize them? Let's say that

9 the other numbers don't change, or they change, what

10 kind of criteria would we be using to decide that,

11 yes, loss of feedwater deserves to be a PI by itself

12 because it gives me this information that I don't have

13 otherwise, or it does not because it doesn't really

14 add anything.

15 You know, this is, I think – and we don't

16 necessarily have to have the answer today, but I think

17 it's an important question.

18 DOCTOR KRESS: But, I think the answer is,

19 is it by itself risk significant?

20 CHAIRMAN APOSTOLAKIS: Well, actually,

21 Hossein gave an answer, he said that their risk

22 implications are different.

23 MR. HAMZEHEE: And, that's the main reason

24 for this study to treat them separately.

25 CHAIRMAN APOSTOLAKIS: And, you should

1 emphasize that and tell the NRR folks that this is an
2 important consideration, that it's not just the number
3 of the PIs that matters.
4 MR. HAMZEHEE: Correct.
5 CHAIRMAN APOSTOLAKIS: But, in this
6 particular case you are also eliminating one or two,
7 but in others you might not, although I didn't see —
8 again, Steve would say that that's for NRR to decide.
9 MR. LEITCH: But, are we losing some
10 significant piece of information by eliminating
11 unplanned power changes? Say it again, you can't draw
12 a connection between that and the risk?
13 MR. MAYS: I'm saying, I don't have — to go
14 back to the three things I needed to be able to do an
15 RBPI, I have to have a model that reflects plant risk,
16 I have to have a baseline performance that allows me
17 to make changes to that model to set thresholds, and
18 then you have performance data. I can't make, in my
19 risk information, a link between going from how often
20 I go from 80 percent to 30 percent power at the plant
21 to what that has to do with risk. And so, therefore,
22 I'm not able to make a risk-based performance
23 indicator from that.
24 But, whether or not that means that that
25 PI is useful for other reasons is something that NRR

1 would have to decide, as to whether or not they wanted
2 to keep it, or not keep it, and I'm not making that
3 judgment here. I'm saying what risk-based performance
4 indicators am I capable of putting into play.
5 MR. JOHNSON: Yeah, and that's — I'm
6 sorry, Steve, I just was anxious to add to the point
7 that you were making. You know, if you look at some
8 of the PIs that we have now, we've said that they've
9 not been — not all of them have been risk informed,
10 but, for example, we know that when you look back
11 historically at plants that have had a significant
12 number of power changes as a result of equipment
13 problems, to address those equipment problems, that's
14 indicative of a plant that's having problems. And so,
15 there may be a situation where you would have a PI,
16 even though from a risk-based PI perspective you
17 wouldn't have that PI, but because of what we are
18 trying to do with performance indicators, and
19 providing an indication of the old raw performance of
20 the plant, you might keep that performance indicator.
21 So, that's the kind of consideration that we'll go
22 through in the change process in deciding to what
23 extent we replace, or add, or whatever, check the PIs.
24 CHAIRMAN APOSTOLAKIS: But, this is where
25 we would like to see some more discussion of these

1 things, and limiting the number of PIs I think – and
2 I think we already mentioned some very valid points.
3 So, out of curiosity, the number of
4 unplanned changes in power, significance changes in
5 power, what kind of an indication is that? I mean, if
6 it's not risk related, what is it then? Is it
7 sloppiness?
8 MR. JOHNSON: Well, it sort of gives an
9 indication, I see Tom from NEI, Tom Houghton from NEI
10 raising his hand, I guess you've got to get near a
11 mic, Tom, to speak, we believe it gives an indication
12 of, yeah, things that are not steady state at a plant.
13 If a plant is having situations that require it to
14 undergo a number of transients, again, setting aside
15 those things that are not induced by the performance
16 of the plant, that are not being generated from some
17 outside influence, but if a plant cannot maintain
18 stable operations because they are continuously having
19 to respond to things that are unplanned, that's
20 indicative of a plant that's beginning to have some
21 difficulty and, perhaps, warrants some follow-up.
22 CHAIRMAN APOSTOLAKIS: So, it really has to
23 do with the culture.
24 MR. HAMZEHEE: Well, it's such an indirect
25 indicator, you just don't know what it's coming from.

1 You can't conclude that that kind of condition may be
2 indicative of some problem, it may be culture, it may
3 be whatever, but it's actually, you know, an indirect
4 indication.
5 MR. HOUGHTON: Tom Houghton, NEI. We've
6 found that it is an indicator. It is more predictive
7 of future problems, and it did have a good
8 relationship with plants which were on the watch list,
9 okay, when the historical data was looked at. Okay.
10 So, it has face validity, I'd say, and it is somewhat
11 predictive, in that if the operations or maintenance
12 are not able to maintain the plant at the power level
13 that was intended in the management plan for operating
14 the plant, that there is a necessity of looking into
15 the problem further. Now, some of the cases have
16 involved bio fouling in condensers that weren't being
17 looked at as closely as before, or feedwater control
18 problems that weren't being looked at as clearly as
19 before, and partly because they weren't part of the
20 design basis or the tech specs of the plant, and so
21 this has led the plants to make a closer look at how
22 they are operating and maintaining beyond what's
23 absolutely required.
24 So, we see some value in that. Now, there
25 have been questions about why 20 percent, why 72

1 hours, et cetera, et cetera, and there are efforts in
2 piloting revisions to this indicator which NRR is
3 proposing to pilot and industry is looking at a
4 similar pilot to try and avoid some of these questions
5 that have arisen as to what was intent, because you
6 want to try and take what was the intent out of it.
7 But, we've found that it's been valuable in the
8 process.
9 CHAIRMAN APOSTOLAKIS: I guess what you are
10 saying is —
11 MR. HAMZEHEE: One thing I would like to
12 note, however, on that example, dependency on watch
13 list, I looked through the data, too, and often times
14 a plant has a lot of power changes after it gets into
15 the watch list, which means the operators are
16 sensitive to regulatory observations that suddenly,
17 truly, I mean, it is so transparent, you know. So,
18 that's why I'm saying it's such an indirect indicator
19 that, you know, it's very hard to fathom what is
20 causing it, and if it is — clearly there are
21 implications, because if you have a lot of power
22 changes they may initiate a transient of some type.
23 CHAIRMAN APOSTOLAKIS: So, what I gather
24 from this is that we just found a performance
25 indicator for the crosscutting issues. Well, that's

1 what you told us. So, if the maintenance department
2 doesn't do a good job –
3 MR. JOHNSON: George, we actually think
4 that the full spectrum of performance indicators and
5 the inspectible area results provide a good indication
6 of crosscutting issues, in that –
7 CHAIRMAN APOSTOLAKIS: I didn't say it's
8 the soul indicator, but it's an indicator.
9 MR. JOHNSON: – in that problems –
10 CHAIRMAN APOSTOLAKIS: Why are we so afraid
11 of this safety-conscious work environment, every time
12 I mention it I get no, ten nos. Why? Is there
13 something magical about it?
14 MR. MAYS: I've never given you a no on
15 that, George.
16 CHAIRMAN APOSTOLAKIS: Otherwise it would
17 have been 100 nos.
18 MR. MAYS: Right, I think you are seeing a
19 consistent situation here, George, and that is we
20 don't have anything that goes up and says this is our
21 direct indicator of safety-conscious work environment,
22 because we don't know how to measure it that way.
23 CHAIRMAN APOSTOLAKIS: I didn't say it was
24 direct.
25 MR. MAYS: But, what we have is –

1 CHAIRMAN APOSTOLAKIS: I didn't say it was
2 the only one.
3 MR. MAYS: — what we have is, multiple
4 ones, that's why we took the sample approach, and
5 that's why we are seeing that there are some cases
6 where we have things that help us in that area, and I
7 think that's appropriate. I don't think we should be
8 afraid to say, my personal opinion is, I don't think
9 we should be afraid to say that we have a sample of
10 things, and we have some that are more direct than
11 others, and giving us indication when that particular
12 area is having difficulty. I think we have those.
13 DOCTOR KRESS: I think you do have, and I
14 think the question of — that bears on the question of,
15 is there an optimum number of PIs, and normally when
16 you ask that question, is there an optimum number of
17 PIs, when you relate to other statistical treatment of
18 things you are talking about a sample and how many
19 samples do I need to have the confidence level that
20 I'm measuring what I think I'm measuring.
21 And, in your case, I don't think you have
22 the capability of determining that optimum, and when
23 you can't determine an optimum in a statistical
24 manipulation or looking at the data, I think you have
25 to just fall back on take as many as you can. I hate

1 to say this, because the industry, you know, I can see
2 them now, but if you can't determine an optimum from
3 statistical analysis of the thing, then it seems to me
4 like the only other option you have. I'd be
5 interested in hearing your reaction to that.
6 MR. MAYS: Well, I think, I'm not sure your
7 taking as many as you can is necessarily the answer.
8 I think the problem is, you are trying to reach a
9 question of figuring out when you reach the point of
10 diminishing returns, and sometimes you can do that
11 because you have data and information on a model to do
12 that very precisely, and sometimes you have to do that
13 from a more judgmental approach.
14 DOCTOR KRESS: I count that in the phrase
15 as many as you can, I mean, that's part of the as you
16 can part.
17 MR. MAYS: I think the bottom line at the
18 end of the day is, do we have confidence that we have
19 a process by which we can detect when plant
20 performance is degrading from a safety standpoint, so
21 that the NRC can take appropriate action to intervene.
22 DOCTOR KRESS: How can you validate that?
23 MR. MAYS: Now, the question for that one
24 is, I don't know that you can do the kind of
25 statistical validation of that that might be desirable

1 to do if you could, but we have a philosophy that says
2 we want to try to have objective, measurable, risk-
3 informed information to do that, and I think, again,
4 this is part of that progress versus perfection
5 discussion, we will have more of it here, and then it
6 has to become a judgment as to whether or not we are
7 achieving much benefit when we do that. That's part
8 of what the ROP process has as their joyful task to
9 figure out, as part of the change process.
10 The next thing we wanted to show you was
11 the results of some of the work from the mitigating
12 systems. We had proposed in the RBPI report that we
13 could come up with 13 mitigating system component
14 class RBPIs for BWRs and 18 for PWRs. These were
15 using the SPAR models again for setting the baselines
16 and the thresholds. We used the system reliability
17 and component reliability studies that we've produced
18 in Research and formerly in AEOD as baseline
19 information to go into those SPAR models. We used the
20 EPIX data for calculating reliability parameters, and
21 we used the current information that's coming in
22 through the Reactor Oversight Process for putting the
23 unavailability data into these models.
24 So, the point here is, this EPIX data for
25 the reliability is the only part of this that is data

1 that isn't already reported to the NRC in some quality
2 fashion that we already know about, so this is the one
3 where we have the implementation issue.
4 And, we used a similar process that we did
5 for the initiating event indicators, for figuring out
6 what the time frame and the right prior was to do
7 that. And, when we did that, because we had – and
8 when you get to reliability, if you look at
9 reliabilities of pumps, and diesels, and other things
10 which have generally mean reliabilities in the
11 vicinity of E-2 or potentially lower, we found that
12 even with a three-year type of time period we still
13 had situations where we would have false positive
14 rates that could potentially exceed the 20 percent
15 that we had set up as an initial basis. And, what we
16 decided to do with that, and you'll see it in the
17 tables as we flip back in a minute, is that whenever
18 we had a reliability indicator that crossed the
19 green/white threshold, we would also add an additional
20 piece of information which is, the probability that
21 the baseline value was still below the threshold. So,
22 basically, recognizing that the probability was a
23 distribution, sometimes the delta between the baseline
24 value and the green/white threshold was fairly small,
25 it would be easy for that distribution to cross the

threshold and we wanted to make sure we gave a little more information to say, well, is it like really across the threshold or is it just barely across, so we gave a little more information because we couldn't always meet the 20 percent false positive threshold that we used.

DOCTOR KRESS: And, will that information be used somehow in the overall plant assessment somewhere?

MR. MAYS: Well, we thought that that was appropriate to use because –

DOCTOR KRESS: It's good information, I guess.

MR. MAYS: – we wanted to have some idea of how sure we were that somebody had gone over that threshold.

DOCTOR KRESS: I think some guidance needs to be developed on how we use that.

MR. MAYS: I think that would have to be done on how to use it, but we thought it might be something that we talk to people about.

DOCTOR KRESS: I definitely think it's useful additional information.

MR. MAYS: I'm going to skip on over to page 18 now and show you what we had for the –

1 CHAIRMAN APOSTOLAKIS: Oh, in general,
2 reading from the original report, I get the impression
3 that based on the numbers you got you can actually
4 have threshold values for classes of components or
5 classes of plants, that you don't necessarily have to
6 have a separate threshold value for each component at
7 each plant.
8 MR. MAYS: Well, we are looking – we are
9 going to look at that.
10 CHAIRMAN APOSTOLAKIS: Is that correct?
11 MR. MAYS: Right now, we have only 23
12 plant-specific models for which we've done this, and
13 one of the things we said we would go back and look at
14 was, was the differences among the plants or within
15 groups so much that you had to do a plant-specific
16 value or whether it makes sense to make a group value.
17 We haven't got all that information to be able to do
18 that yet, but that's one of the things that was
19 proposed as a way to deal with the number of – number
20 and types of PIs.
21 CHAIRMAN APOSTOLAKIS: Which is very
22 annoying here, I guess, but not the Maintenance Rule,
23 which is another mystery to me. Why in the Maintenance
24 Rule the licensee was asked to submit plant-specific
25 thresholds, and everybody thought it was great, but

1 when it came to the Revised Oversight Process it's
2 something that is like, you know, we don't want to
3 hear about.
4 MR. MAYS: One of the comments we've
5 received from industry was a concern that if we have
6 risk-based performance indicators set up this way that
7 there might be a potential conflict between thresholds
8 here and values set for the Maintenance Rule.
9 CHAIRMAN APOSTOLAKIS: And, that's
10 something we cannot resolve?
11 MR. MAYS: No, we could potentially resolve
12 that.
13 CHAIRMAN APOSTOLAKIS: Yeah.
14 MR. MAYS: The issue has to do, almost from
15 a technical standpoint, to do with the fact that in
16 this case we are doing a single-point variate
17 analysis, we take one thing, we hold everything else
18 constant, and we see what the impacts are.
19 Aside from the fact that they may be using
20 a slightly different risk model at the plant than we
21 were using, that's one of the bigger issues. One of
22 the things the plants were able to do, because they
23 were having a more integrated look at this, was to
24 say, for example, okay, suppose I desire to be able to
25 have a greater unavailability of my diesel generators,

1 because I have a financial or other reason for
2 conducting some on-line maintenance, well, what I will
3 do is, I will trade that off by making sure I have a
4 stricter standard for my reliability, so that in net
5 the risk hasn't changed significantly.
6 Well, if you have a single variable
7 analysis like we have here, you can't make that
8 tradeoff, because you are holding all the other things
9 constant, and what we will see when we get down a
10 little further in here, we talked about ways of
11 reducing this, one of the things we are proposing is
12 a more integrated way of looking at them, which can
13 allow for that kind of stuff to go on.
14 So, the Maintenance Rule was for the
15 licensees to set their own standards and for us to
16 monitor that they were doing those. So, I think
17 that's probably the answer why they didn't have a
18 problem at that level, because they were setting it on
19 their own standards, using their own risk information,
20 and being able to trade off back and forth where they
21 felt appropriate.
22 Anyway, coming to this example here, I
23 didn't want to go through all of the ones on each
24 case, I wanted to point out a couple things. One of
25 the things that you can see when you look at these

1 examples is that the case of the 95th percentile,
2 let's go down to emergency AC power unreliability,
3 what you'll end up finding there is a case, if you
4 take the 95th percentile, you get a value that's
5 almost up to the red value, if you were to take that
6 as your green/white threshold.
7 CHAIRMAN APOSTOLAKIS: Is that right? It's
8 close to – where are you looking?
9 MR. MAYS: I'm looking at emergency AC
10 power unreliability, which is right here, this line.
11 CHAIRMAN APOSTOLAKIS: Oh, yeah, right,
12 because for the others that's not true, right?
13 MR. MAYS: Right, for the others it's not
14 necessarily true, so that was one of the reasons, an
15 example of a reason why we thought that the 95th
16 percentile approach may not be the most appropriate
17 way to do with these. So, that was an example.
18 CHAIRMAN APOSTOLAKIS: Well, I would say it
19 is not.
20 MR. MAYS: Another thing that we found when
21 we looked at some of this stuff is that sometimes,
22 because of the risk importance of a particular
23 component, even if its reliability or its availability
24 goes to one, it never producers the delta CDF
25 necessary to get to E-5 or E-4 to get you to the

1 yellow or red zones. So, that raises a question, is,
2 well, maybe we don't want to use that as an indicator,
3 or maybe we want to do something different.
4 We haven't come to a complete conclusion
5 on that, and sometimes what you'll see is, we'll find
6 that you can, in fact, reach those thresholds, but
7 only if you exceed te tech spec allowed outage times
8 for your equipment. So, the question is, do we want
9 to have an indicator that has a threshold that they
10 can only get to if they are violating the license.
11 I'm not sure that necessarily makes —
12 CHAIRMAN APOSTOLAKIS: So, not reached
13 means not reachable.
14 MR. MAYS: Not reached has two things in
15 these tables. One of them has a footnote, I think,
16 which — we eliminated the text on that, but the
17 footnote in the report, we have a not reached and we
18 have a not reached with a footnote, and we distinguish
19 between the ones that can't be reached because the
20 risk importance of the component isn't significant
21 enough, and those which it could be reached but it
22 would only be reached if you violated your tech specs,
23 in terms of operation. So, it's not really clear to
24 us which one makes the most sense here, we are just
25 laying out what the feasibility is of using an

1 indicator in that particular area, and what we were
2 trying to do is demonstrate that it's possible to set
3 thresholds for these particular values on a plant-
4 specific basis.
5 CHAIRMAN APOSTOLAKIS: So, what's the
6 difference between this and what the current process
7 has? Are you increasing the number of indicators?
8 MR. MAYS: Well, first off, we have
9 specific reliability indicators.
10 CHAIRMAN APOSTOLAKIS: That's correct.
11 MR. MAYS: We have availability indicators
12 and the reliability indicators have plant-specific
13 baselines and performance thresholds for them, and we
14 have, in another issue that we have, and we have a
15 broader coverage so we have more of them, and the
16 other thing we have, if you look at the bottom of that
17 page, we have three component class indicators for
18 air-operated valves, motor-operated valves and motor-
19 driven pumps, which go across systems. And, what we
20 have in that case is, we have a baseline value that we
21 get for the plant, and then what we have done is, we
22 said if we increased that value by a certain factor,
23 so, for example, the green/white threshold for AOVs
24 would be at 2.2 times increase in the baseline value
25 would get you to the green/white threshold, and what

1 we did there was, we took all the AOVs in the risk
2 assessment, said if we double them that's what gets us
3 to E-6. If we go up by a factor of 13, that's what
4 gets us to E-5.
5 CHAIRMAN APOSTOLAKIS: What's the point of
6 that? I mean, doesn't it go against what Hossein said
7 earlier, that not all AOVs have the same risk
8 significance?
9 MR. MAYS: Potentially, but what we are
10 trying to do here is say, if we had a broad
11 programmatic problem, if our AOV maintenance problem
12 was a problem, or general maintenance was a problem,
13 or we had a problem with our design and implementation
14 of motor-operated valves, if they were all to go have
15 a degradation, how much degradation would all of them
16 have to be going under in order to reach this
17 particular threshold.
18 CHAIRMAN APOSTOLAKIS: So, that would be a
19 useful incite to the Option 2, no?
20 MR. MAYS: I don't know enough about that
21 to be able to —
22 CHAIRMAN APOSTOLAKIS: That's a good
23 answer.
24 MR. MAYS: — to say.
25 CHAIRMAN APOSTOLAKIS: Very few of us know

1 enough.

2 MR. MAYS: Okay.

3 Moving on to the next thing that we were
4 asked to look at by the user need letter, had to do
5 with containment performance, because there was a
6 limited number of things that we had in the ROP to
7 deal with containment. Unfortunately, we were able to
8 identify things that could potentially be used as
9 risk-based performance indicators for containment,
10 mainly the performance of the drywall sprays in the
11 Mark I BWRs, and the performance of large containment
12 isolation valves in the others.

13 DOCTOR KRESS: This information came out of
14 older PRAs?

15 MR. MAYS: Right, these were the things
16 where it says what performance could have an —

17 DOCTOR KRESS: Yeah, you don't deal with
18 those in SPAR.

19 MR. MAYS: — well, not quite, when you say
20 SPAR, SPAR is a broad program, there is the level 1
21 SPAR models, there are LERF level 2 models, there are
22 shutdown models, and there are potential external
23 event stuff. So, SPAR represents that whole section.

24 DOCTOR KRESS: So, you are using the level
25 1 SPARs for this study.

1 MR. MAYS: We are using level 1 for the
2 initiating events and the mitigating systems, for the
3 containment we were looking to use LERF models.
4 DOCTOR KRESS: I see.
5 MR. MAYS: And, we are going to use LERF as
6 our metric, for containment related issues.
7 DOCTOR KRESS: And, that's another one of
8 my questions, but I'm sure you are going to discuss it
9 anyway.
10 MR. MAYS: So, we were planning on doing
11 that.
12 CHAIRMAN APOSTOLAKIS: Before we leave the
13 mitigating systems, there was a sentence in the
14 report, Appendix A, page A-25, "The same component
15 rate importance criteria were used to select class
16 indicators. However, the system level – versus the
17 importance values were determined using the multi-
18 variable group function available in SAPHIRE." What
19 is this multi-variable group function available?
20 MR. MAYS: I think that's just a fancy way
21 of saying we changed all of the components to have the
22 same degradation at the same time, and in random model
23 again. Would that be correct, Steve?
24 CHAIRMAN APOSTOLAKIS: You have to come to
25 the microphone, please, and speak with sufficient

1 clarity and volume.

2 MR. MAYS: Fortunately, George, you and I

3 never have that problem.

4 MR. EIDE: Steve Eide from the INEEL, and

5 I believe Steve is correct. I don't know the

6 specifics of that actual —

7 CHAIRMAN APOSTOLAKIS: Which Steve, this

8 Steve is correct?

9 MR. EIDE: Steve Mays, I don't the

10 specifics of that actual —

11 CHAIRMAN APOSTOLAKIS: But, it sounds

12 better, right?

13 MR. EIDE: — module in SAPHIRE.

14 CHAIRMAN APOSTOLAKIS: Multi-variable

15 function, this is really impressive.

16 MR. MAYS: We have the capability in the

17 SAPHIRE code to go over and change multiple components

18 at one time with a change set, and that's what we

19 basically did.

20 CHAIRMAN APOSTOLAKIS: Okay.

21 MR. MAYS: Moving to containment, the

22 problem we had, we were unable to develop containment

23 performance indicators, because we don't have the

24 models and the data currently available to be able to

25 do that on a broad enough — either on a plant-specific

1 basis for sure, or on all the different classes and
2 types, so we were limited there by our capability
3 right now to be able to produce performance indicators
4 for containment.
5 DOCTOR KRESS: You do what you can, is that
6 it?
7 MR. MAYS: That's correct.
8 DOCTOR KRESS: But, I would like to – you
9 are not necessarily going to limit to LERF when you
10 get around to doing it. You mentioned that –
11 MR. MAYS: Our original intention was to
12 use LERF as the metric for the containment
13 performance, because that would be consistent with
14 what we have in Reg Guide 1174 and other applications.
15 It's potential that we could go to something different
16 from LERF if somebody thought that that was useful and
17 worthwhile, but right now that's what we were looking
18 at on the basis of what we have available.
19 DOCTOR KRESS: I know a few people who
20 think that it would be worthwhile to include – LERF is
21 all right, but consistency, you know, is the hobgoblin
22 or something or other.
23 MR. MAYS: Foolish consistency is the
24 hobgoblin of small minds.
25 DOCTOR KRESS: But, I think one ought to be

1 concerned in the regulatory arena with late
2 containment failures and also —
3 MR. HAMZEHEE: In Phase 2 we are going to
4 look into this, to see if large late failures are also
5 risk significant.
6 DOCTOR KRESS: — and I think you could
7 probably deal then with just the conditional
8 containment failure problem then.
9 MR. MAYS: Right. The issue then again
10 comes to, do we have a set of models that reasonably
11 reflect some understanding of the risk that we can put
12 data through and do, and right now we are just not
13 there.
14 DOCTOR KRESS: Yeah, well, you know, my —
15 I'm urging you not to think of risk just as prompt
16 fatalities, that's my point.
17 DOCTOR BONACA: Just one comment I have,
18 and probably I'm wrong, but because in many cases you
19 cannot really identify a meaningful RBPI, you simply
20 don't do that, and then you take the opportunity, you
21 know, to develop what you can get, but you want to
22 make sure that what you can get is meaningful, too,
23 right? I mean, what I'm trying to say is that, I'm
24 left with the impression that, you know, because of
25 that you are going to get a set of indicators that may

1 not be so significant after all, but the reason why
2 you got to those is because that's all you could get.
3 DOCTOR KRESS: I think one of their
4 criteria was, they have to be risk significant.
5 DOCTOR BONACA: They have to be, okay, but
6 I'm trying to understand the time, you know, how many
7 facets of this thing you are going to see, just maybe
8 two or three, and, you know, does that give you the
9 picture you want, or is it just all you can get. And,
10 I'm not sure they are the same thing.
11 CHAIRMAN APOSTOLAKIS: There is some of
12 that, this is a significant step forward, though.
13 DOCTOR BONACA: Oh, no, I'm not —
14 CHAIRMAN APOSTOLAKIS: This could be never
15 sought perfection.
16 DOCTOR BONACA: — I understand that.
17 DOCTOR KRESS: Progress is what we —
18 CHAIRMAN APOSTOLAKIS: Progress, we work
19 with deltas.
20 MR. LEITCH: Wouldn't performance on
21 integrated leak-rate tests be a significant PI in
22 this?
23 MR. MAYS: I think that's been looked at
24 before. You could go back and look at performance
25 under leak-rate tests. The problem we've had in

1 looking at performance under leak-rate tests is, you
2 might be able to see that leak-rate test performance
3 has changed, but the question is, what's the risk
4 significance of that information? And, when you look
5 at the risk assessments and things that have been
6 done, the leak tightness of the containment in the
7 kinds of things that those things measure is rarely,
8 if I'm aware of, ever the dominant contributors to the
9 off-site releases.
10 DOCTOR KRESS: It's never even risk
11 significant.
12 MR. MAYS: It's not even close.
13 DOCTOR KRESS: But, that's when your risk
14 measure is prompted out.
15 MR. MAYS: That's correct.
16 DOCTOR KRESS: So, that's why I'm saying,
17 don't just focus on prompt fatalities.
18 MR. MAYS: Right.
19 DOCTOR KRESS: You might want that as one
20 thing.
21 MR. MAYS: But, even in the cases of when
22 you look at latent cancer deaths and risk significance
23 —
24 DOCTOR KRESS: It's not significant there.
25 MR. MAYS: — it's not significant there

1 either.

2 DOCTOR KRESS: It's a risk of possible land

3 contamination, perhaps.

4 MR. MAYS: Maybe, but I'm saying, comparing

5 to the other things that would do land contamination

6 —

7 DOCTOR KRESS: That particular one is a low

8 risk.

9 MR. MAYS: — it's pretty small, too.

10 DOCTOR KRESS: But, late containment

11 failure now is a different issue. It can be risk

12 significant from the standpoint of cancers and land

13 contamination. So, you know, but you are right on the

14 leak rate, unless it really gets bad.

15 MR. MAYS: The way it really gets bad is

16 somebody leave some major valve open, and that's what

17 I'm saying we would have —

18 DOCTOR KRESS: You would capture that

19 anyway.

20 MR. MAYS: Right.

21 MR. HAMZEHEE: And, that was one of the PIs

22 on the Reactor Oversight Process, but they also

23 eliminated that from the list.

24 MR. LEITCH: Okay, thanks, I understand.

25 CHAIRMAN APOSTOLAKIS: I wonder whether it

1 would make sense to take the set of the performance
2 indicators we have, or we will have, and go to a real
3 accident or incident, and see whether, like Three Mile
4 Island, whether you would see any change in these
5 things before the incident occurred.
6 MR. MAYS: I'm going to show you something
7 that directly relates to that in a little bit.
8 CHAIRMAN APOSTOLAKIS: Good.
9 What did you say, Tom?
10 DOCTOR KRESS: We probably don't have the
11 data for Three Mile Island.
12 CHAIRMAN APOSTOLAKIS: Well, for something,
13 something, I mean, to validate that this process would
14 make sense.
15 MR. MAYS: Your point is, if there is
16 something that is dominant contributors to the risk,
17 are we having measures in our PIs that relate to
18 those, and I've got a particular slide that shows
19 that.
20 CHAIRMAN APOSTOLAKIS: Okay, so I'll wait
21 until we come to that then. Okay.
22 Is this a good place to take another short
23 break?
24 MR. MAYS: Sure.
25 CHAIRMAN APOSTOLAKIS: Okay. Then, we're

1 taking a seven-minute break.

2 (Whereupon, at 10:53 a.m., a recess until

3 11:03 a.m.)

4 CHAIRMAN APOSTOLAKIS: Okay.

5 MR. LEITCH: Can I ask just one question

6 for understand here before we get started again, or as

7 we get started again?

8 CHAIRMAN APOSTOLAKIS: Please, quiet.

9 MR. LEITCH: I'm looking at Appendix A, and

10 there's a number of pie charts —

11 CHAIRMAN APOSTOLAKIS: Page?

12 MR. LEITCH: — I guess it's actually

13 Appendix D, page 56, where the pie charts begin.

14 CHAIRMAN APOSTOLAKIS: Okay.

15 MR. LEITCH: And, I want to be sure I'm

16 correctly interpreting this information, just to pick

17 page 56 as an example, I think that's the first one,

18 it says areas not covered, 3 percent, indicators 2

19 percent, industry-wide trending 95 percent. Does that

20 mean, am I correctly interpreting that that 95 percent

21 of the issues are so infrequent that they are not

22 amenable to individual plant performance indicators,

23 that they have to be trended on an industry basis?

24 MR. MAYS: That's close.

25 MR. LEITCH: Okay.

1 MR. MAYS: When you look at the – look at
2 what was in the IP database for the core damage
3 frequency associated with initiators for this
4 particular plant, what you find is that 95 percent of
5 the sequences involved an initiators other than the
6 ones we have direct indicators for, or the ones in
7 areas not covered. So, this might be a plant, for
8 example, that had really high contribution from loss
9 of off-site power events, or station blackout events,
10 since we don't have an indicator on a plant-specific
11 basis for that kind of thing, that would have to be
12 covered through the industry-wide trending. That's
13 how you would be able to see whether or not you
14 thought you had a problem, plus the plant-specific
15 inspections and the baseline inspections would go and
16 look at the areas that are not covered by indicators
17 to see if the performance that would impact were
18 changing. So, this is just to kind of give you – you
19 are right, you are getting kind of the feel for which
20 portions of the initiating event indicators of the
21 risk are covered by the indicators, and which portion
22 would have to be either done by inspection and/or
23 trending.
24 DOCTOR KRESS: But, what is this a
25 percentage of?

1 MR. MAYS: Percentage of total CDF.

2 DOCTOR KRESS: Percentage of total CDF.

3 MR. MAYS: Right.

4 MR. LEITCH: Okay, thanks.

5 MR. MAYS: Okay.

6 Moving on to shutdown, this was an
7 important area because we didn't currently have in the
8 ROP any shutdown direct indicators. We looked at that
9 and we found that we couldn't do initiating event
10 indicators for shutdown because they just don't happen
11 frequently enough, but we did come up with some fairly
12 interesting things to do with respect to mitigation.
13 And, this has to do with several things.

14 We formulated a process by which we would
15 take into account the RCS conditions, vented, not
16 vented, open, not open, time after shutdown for decay
17 heat purposes, the availability of mitigating system
18 trains in those particular scenarios, and then we were
19 able to go back and try to set thresholds and
20 performances.

21 This one is a little different in picture
22 than what we had before, where we are actually going
23 out and calculating reliabilities and calculating
24 availabilities, now what we are doing is we are taking
25 a slightly different approach that says, if I have a

1 model that represents how a BWR or PWR responds can I
2 get groups of things, where if I spend time in those
3 scenarios I know those contribute more or less to
4 risk. So, we came up with – for both the BWRs and
5 PWRs, were able to come up with thresholds. We put
6 together, started off actually with three categories,
7 low, medium and high, corresponding to an amount of
8 increase in CDF per day associated with being in those
9 conditions.
10 CHAIRMAN APOSTOLAKIS: You know the
11 question you are going to get from some of my
12 colleagues in May, how can you do this if you don't
13 have a good shutdown PRA?
14 MR. MAYS: This goes back to the first
15 point I made earlier, in order to do the risk-based
16 performance indicators I have to have a reasonable
17 model of how a plant responds.
18 CHAIRMAN APOSTOLAKIS: Do you think you
19 have it now?
20 MR. MAYS: I think I have it for these two,
21 because what I have in these two cases is a plant-
22 specific model from a representative PWR and BWR, that
23 they happened to use for doing their shutdown – for
24 shutdown risk models. So, I think I have something
25 that's reasonable here that I can use. I don't have

1 something for every plant. I don't have the SPAR
2 models developed for every plant, or even for the
3 groups of plants yet, but I have this information
4 that's a starting point for progress, not perfection.
5 So, that was the basis for doing this.
6 So, when we looked at that, we said, all
7 right, let's go back to the baseline and say, how much
8 time do these people typically spend in various
9 configurations, because it's just necessary to go
10 through some of them in order to complete a shutdown.
11 And so, we would measure performance as being
12 deviations from the nominal performance that you have
13 to do, just to go and conduct a shutdown operation,
14 and if you spend more time in particular
15 configurations of higher, lower, or medium risk
16 significance, then that would be the basis for us
17 deciding what the thresholds would be.
18 And, when we came to that, we also
19 recognized that for PWRs there's a special category of
20 the early reduced inventory situations that they have
21 to go into in order to be able to do that, which
22 represents a higher risk significance than most of the
23 other configurations they go to, and because when they
24 are in that particular mode they are under the
25 shutdown guidance of NEI guidance on — what was the

1 number of that, Tom, I can't remember?

2 MR. HAMZEHEE: It's 91-06.

3 MR. MAYS: 91-06? 91-06, which says, when

4 you are going into early reduced inventory modes you

5 have to take certain compensatory measures with

6 respect to availability of power, availability of

7 injection systems, so we said if you are complying

8 with that in your early inventory, and you don't spend

9 more than the nominal time, then we will do that. If

10 you spend more than nominal time in that one, then we

11 treat that as if it's a high. So, we treated that

12 category a little differently.

13 DOCTOR KRESS: That's a really different

14 concept than what you did for the others.

15 MR. MAYS: That's correct, because this is

16 all we were able to do with the information we had.

17 DOCTOR KRESS: And, it goes back to my

18 concern about whether the baseline, which in this case

19 is called nominal, is sufficiently good enough, and

20 whether or not you are penalizing some plants — you

21 know, if I were a plant that took long times at high-

22 risk significant configurations earlier, then I would

23 be able to continue doing that on this and not get a

24 white reading, because you are basing it on that as a

25 starting point. This part worried me more than any of

1 it.

2 MR. MAYS: I understand your point. If we

3 had plant-specific history and plant-specific —

4 DOCTOR KRESS: I understand.

5 MR. MAYS: — values, that would be more of

6 a concern.

7 DOCTOR KRESS: Yeah.

8 MR. MAYS: I think what we are trying to do

9 here is say, what's typically representative of kinds

10 of times that industry generally spends in these

11 areas, so these baselines here were based on some

12 information —

13 DOCTOR KRESS: They are basically industry

14 average lines.

15 MR. MAYS: — industry information, so if

16 somebody were to go and then start spending more time

17 in risk-significant configurations, they would not be

18 benefitted by having done that, the particular

19 arrangement you are talking about.

20 So, again, we are talking the progress,

21 not perfection, situation here. We have nothing now,

22 and we are trying to do something that's a little

23 better and a little more risk informative.

24 CHAIRMAN APOSTOLAKIS: So, the categories

25 low, medium and so on, are determined by the condition

1 of core damage probability?

2 MR. MAYS: Right.

3 CHAIRMAN APOSTOLAKIS: And, what are the

4 values?

5 MR. MAYS: E-4, -5, or -6 per day, I

6 believe, that equate to core damage frequency for the

7 year of E-4, -5, or 06, if they were to spend their

8 time in that condition for a full day.

9 CHAIRMAN APOSTOLAKIS: Full day?

10 MR. MAYS: For a day. In other words, for

11 example, the high configuration would say, if you

12 stayed in that configuration for a day you would add

13 E-6, or E-4, to your core damage frequency associated

14 for that plant for that year.

15 CHAIRMAN APOSTOLAKIS: And, you would take

16 the day divided by 365 again, or that doesn't enter

17 into this?

18 MR. MAYS: We are saying that if you are in

19 a high configuration –

20 CHAIRMAN APOSTOLAKIS: Yeah.

21 MR. MAYS: – you are accumulating a yearly

22 increase of E-4 per day. That's the rate of

23 accumulation of the core damage frequency.

24 CHAIRMAN APOSTOLAKIS: Yes, I don't

25 understand that, but that's okay.

1 DOCTOR KRESS: It's like averaging it out
2 over the year.
3 MR. MAYS: That's right.
4 CHAIRMAN APOSTOLAKIS: Does the fraction of
5 one day over 365 enter anywhere?
6 MR. MAYS: Sure. What happens is, we base
7 all of our data gathering and our analysis on how many
8 days or hours you spend, and then the rate for the
9 high category is based on that translating to the
10 year. So, we do our calculations on the days, and the
11 rate for the threshold is based on the year.
12 CHAIRMAN APOSTOLAKIS: Right, and that's
13 wherein I offered the comment earlier I read, that no
14 matter how long you are there, if you divide by 365
15 you are effectively reducing its significance.
16 MR. MAYS: But, we weren't doing that.
17 That's what they didn't understand.
18 CHAIRMAN APOSTOLAKIS: Okay.
19 MR. BOYCE: It sounds like I don't have an
20 action item anymore.
21 CHAIRMAN APOSTOLAKIS: What?
22 MR. BOYCE: It sounds like it's understood
23 and we don't have an action item over on our side
24 anymore.
25 MR. MAYS: I wouldn't be that bold.

1 The next thing I wanted to show was, let's
2 put up the PWR chart, we can go through this one a
3 little quicker because we have others to do. So,
4 basically, what we were talking about here is, you
5 would start on the left-hand side and you would,
6 basically, start at the top of the chart and move
7 yourself down and you would see for various different
8 configurations, like whether you are pressurized,
9 whether you are in mode 4, whether your reactor core
10 system was in tact, how many days after shutdown we
11 were, those are the going in conditions, for which we
12 then went and evaluated configurations and
13 combinations of configurations that previous PRAs on
14 shutdown have said to be important.
15 So, we would go back and, for example,
16 let's take an example for the one diesel generator, if
17 one diesel generator is out of service when you are in
18 pressurized mode for hot shutdown with the RCS in
19 tact, that constitutes the low category. So, what we
20 would do is, we'd gather up the amount of time you
21 spent in that low category, compare that to the
22 thresholds.
23 CHAIRMAN APOSTOLAKIS: Can you point to us
24 where you are?
25 MR. MAYS: Okay. I am on this row right

1 here, pressurized cooldown, Mode 4, RCS in tact, and
2 I'm looking at the impact of having one diesel
3 generator out of service.
4 So, we went back and looked at several
5 other configurations that were found to be important
6 to shutdown risk, relating to power availability, RHR
7 availability, secondary cooling trains, the
8 availability of the RWST, other things of that nature,
9 and we laid them out and if we have no entry in the
10 block then that means that particular condition does
11 not present a significant increase in the rate, so
12 what we do is, the nice thing about this, although it
13 looks busy, is that before the outage even starts,
14 when you've done your outage plan, you can go into
15 this table and see what equipment you are having out
16 when under what states, and before you even start have
17 an idea about where you could be accumulating more
18 risk than others. So, this is a nice tool for both
19 utility and the inspectors to have before you even go
20 in.
21 CHAIRMAN APOSTOLAKIS: Isn't this similar
22 to what they are already doing with the various tables
23 they have risk configurations to avoid?
24 MR. MAYS: Correct.
25 CHAIRMAN APOSTOLAKIS: But, this is more

1 detailed, perhaps.

2 MR. MAYS: I'm not sure if it's more or
3 less detailed, but it has a similar concept. What we
4 are doing is saying, for a particular outage, we would
5 measure the time you spent in low conditions, the time
6 you spent in medium conditions, the time you spent in
7 high conditions, and we would compare those to the
8 thresholds, and that would tell us whether you were
9 spending excess time on those conditions, and then we
10 would know exactly what conditions we were in, we'd
11 know what to be able to go look for, so the idea here
12 is, is that you are going to be able to know in
13 advance what conditions to avoid. You are going to
14 know in advance what conditions you are planning to go
15 into, and the inspector, during an outage, if
16 something changes from the inspection plan, can go
17 right back to a table like this and say, all right,
18 now they are changing from this scenario to that
19 scenario, is that one I have to pay attention to and
20 worry about. And then, as we gather up the data as
21 you go through the outage, we can say at the end
22 whether your performance was basically nominal or
23 whether you accumulated enough risk in your off-
24 nominal conditions to warrant attention from the NRC.
25 That's the philosophy.

1 DOCTOR UHRIG: Would you get the same
2 information from one of these automated PRA
3 computerized systems?
4 MR. HAMZEHEE: Not exactly.
5 MR. MAYS: Potentially, yes, I mean, but
6 I'm not sure exactly how they are gathering and
7 putting the information in, and how they are profiling
8 out the outage, but conceptually it's a similar
9 scenario. We are saying, what's the risk associated
10 with being in particular scenarios as we go.
11 DOCTOR UHRIG: Yes.
12 MR. MAYS: And so, it has a similar
13 foundation as the shutdown risk monitors in principle,
14 and so we think this is something that's fairly easy.
15 It's fairly easy to tell how much time you spent in
16 each of these configurations, because you planned it
17 all out before you start, and you monitor what you did
18 when you went through it, so if we were to get
19 information on how much time they spent in each of
20 these categories it would be fairly easy to do a PI.
21 Now, going back to the three things we
22 talked about earlier, having a model, having
23 performance data, we think we have, you know,
24 reasonable general stuff, and it is generic based more
25 than plant specific in this case. But, right now we

1 don't have data reported to us on the amount of time
2 spent in these things, so we would either have to have
3 somebody go out and get it ourselves, or we'd have to
4 have the industry produce it for us, in order to be
5 able to have a PI with respect to shutdown.
6 MR. HAMZEHEE: And, I think currently the
7 risk assessment that they do during the shutdown is,
8 they input all the equipment availability and how much
9 time they spent, and then they get a risk profile on
10 a daily basis, but they don't question as to how long
11 they should or should not stay in certain
12 configurations.
13 MR. MAYS: I'm not sure whether they do
14 that or not.
15 MR. HAMZEHEE: But, they can do it if they
16 want to, they can go change some parameters and get
17 the results in the shutdown risk models.
18 DOCTOR KRESS: I'm particularly interested
19 in whether this will be part of the database you are
20 going to give back, because it's my view that you have
21 to have this information if you are going to do — if
22 you are going to include shutdown risk within, say,
23 the 1.174 risk matrix, this doesn't do it by the way,
24 this information has to be fed back into some sort of
25 shutdown risk PRA in order to actually get the

1 contribution of shutdown risk to the total risk, and
2 also to determine the things like importance measures,
3 because this doesn't get reflected in importance
4 measures at all.
5 MR. MAYS: Indirectly it does. The
6 importance of the particular components, which is also
7 dependent on the particular condition that you are in,
8 is explicitly in the table.
9 DOCTOR KRESS: Oh, yeah, I'm sorry, it
10 doesn't show up in the importance measures you did for
11 the at power.
12 MR. MAYS: That's correct.
13 DOCTOR KRESS: Yes. I mean, you've got
14 some importance measures for components. This doesn't
15 reflect there in that.
16 MR. MAYS: Right.
17 DOCTOR KRESS: But, you do — you are going
18 to have this kind of information for, you know, the
19 fleet of plants and for individual plants, if you are
20 really going to do a proper shutdown risk assessment.
21 So, I hope somebody starts developing a database on
22 this.
23 MR. MAYS: Well, that's what we've
24 proposed, that if we have that kind of data we can at
25 least put together some information that would give us

1 indication of when something might be changing
2 significantly.
3 DOCTOR KRESS: Uh-huh.
4 MR. MAYS: And, I think it's a good start.
5 DOCTOR KRESS: Yes.
6 MR. MAYS: Going on to the next thing,
7 which was fire events, this won't take very long at
8 all. Basically, the issue was from an initiating
9 event standpoint they don't happen often enough for us
10 to do plant-specific analysis of them. From the
11 mitigating system standpoint, we've identified what
12 systems would be important, which was the reliability
13 and availability of the fire suppression systems would
14 be the indicator we would try to put together, but we
15 really don't have the data to do that, to quantify
16 baseline and performance values, so —
17 CHAIRMAN APOSTOLAKIS: Can we discuss a
18 little bit this issue of timely detection?
19 MR. MAYS: Right.
20 CHAIRMAN APOSTOLAKIS: And, I think it's
21 related to whether an indicator is leading or lagging,
22 is that correct?
23 MR. MAYS: No. Whether an indicator is
24 leading or lagging is what you are measuring and
25 comparing to. For example, all indicators, by

1 definition, which you gather from data are lagging the
2 data that you are getting, but they may be leading of
3 some higher order effect.
4 CHAIRMAN APOSTOLAKIS: Core damage
5 frequency.
6 MR. MAYS: Correct.
7 CHAIRMAN APOSTOLAKIS: Core damage, yeah.
8 MR. MAYS: So, the issue here is, does the
9 occurrence rate of information for this particular
10 thing happen so infrequently, if I have, for example,
11 losses of off-site power which only happens in the
12 ball park of once every 30 years or so at a plant,
13 then I'm not going to accumulate data in a sufficient
14 period of time to be used effectively in the Reactor
15 Oversight Process, to go year by year and say to
16 myself, where does this plant need more or less
17 attention. So, I can't make that kind of an
18 assessment directly with an indicator for things that
19 have a low frequency of occurrence.
20 DOCTOR KRESS: Is loss of off-site power
21 under the control of the licensees?
22 MR. MAYS: Some of it is and some of it
23 isn't.
24 DOCTOR KRESS: It could be a lack of, say,
25 a performance issue?

1 MR. MAYS: Right.

2 DOCTOR KRESS: Okay.

3 CHAIRMAN APOSTOLAKIS: But, is timely also
4 referring to the fact that if something happens it's
5 too late?

6 MR. MAYS: No, timely refers to the fact
7 that if there is changes in the performance, my sample
8 period is such that I can reflect and see that on an
9 ongoing basis and take action to deal with it on the
10 basis of that information.

11 So, if I have something like a LOCA –
12 steam generator tube rupture frequency, or a LOCA
13 frequency on a plant-specific basis, there aren't
14 enough events coming along that allow me to trend how
15 that plant's performance is related to that particular
16 event. So, fire events comes in the same scenario
17 again, the frequency of fires at plants is low enough
18 that it's just not amenable to timely trending for
19 indicator purposes.

20 Now, we can do industry-wide trending on
21 that stuff, and we can cover the stuff that's not in
22 PIs through the inspection program, which is a little
23 more deterministic in some cases, the approach, but we
24 have a way to deal with them, but we don't have the
25 ability to do timely indicators of them, from an RBPI

1 standpoint.

2 DOCTOR KRESS: How would you get the data

3 in that middle bullet?

4 MR. MAYS: Data in?

5 DOCTOR KRESS: The fire suppression system.

6 MR. MAYS: Oh, if we were to be able to get

7 information from the plants on the number of times

8 that they find failures in the suppression systems, or

9 detection systems, the number of times they test them,

10 or demand them, those are the kinds of things – the

11 same kinds of information we get for diesel

12 generators, or motor-operated valves, is not currently

13 reported.

14 DOCTOR KRESS: Do they test these fire

15 suppression systems?

16 MR. MAYS: Some of them have testing

17 information, some of them don't. We have to see what

18 they have in order to see whether we can make timely

19 indicators. And, availability of these things is

20 something else that could be tracked, but right now

21 that information isn't being tracked and reported in

22 EPIX or any of the other stuff that we have

23 availability to, so we are unable to do indicators

24 directly on those.

25 CHAIRMAN APOSTOLAKIS: So, the response

1 time of the fire brigade during drills, that would be
2 an indicator if it were reported? Is it reported?
3 MR. MAYS: I don't recall that when we
4 looked at the fire risk assessments that the response
5 time of the fire brigade was a really significant
6 factor in the risk. I think what we found was, the
7 probability of detection and suppression was generally
8 more important, and I think Bob Youngblood has some
9 comments on that.
10 CHAIRMAN APOSTOLAKIS: Yes, but the
11 probability for suppression is really a judgment that
12 comes from the fact that you are going to have the
13 fire brigade, you are going to have CO_2 systems and
14 all that. The problem is that the models are not
15 detailed enough.
16 MR. YOUNGBLOOD: That's the point I was
17 going to mention, Bob Youngblood, ISL, we have — we've
18 also had this report reviewed by fire PRA people, and
19 that's one of their comments. If we were using IPEEEs
20 in this, and they have a lot less detail in that area,
21 and one of our commenters said specifically that he
22 thought the fire brigade performance was an
23 interesting area, it's not, by the way, equipment
24 related necessarily, which would be another
25 desideratum, but he wasn't sure that the way IPEEE has

1 handled the whole thing that we were necessarily
2 getting the right perspective.
3 CHAIRMAN APOSTOLAKIS: Yes.
4 MR. MAYS: So, at any rate, we don't have
5 any fire initiators, fire initiator or mitigating
6 system PIs to propose to NRR, because we don't have
7 the feasibility to do them right now.
8 The next thing addresses, Tom, part of
9 what you just talked about in the pie charts. We
10 looked to see how much risk coverage the RBPIs were
11 giving us, and we took kind of two approaches, kind of
12 a Fussell-Vesely and a Risk Achievement Worth approach
13 to look at the thing. So, let me flip back to the
14 next table on page 27 here. What we went and said,
15 let's take a look at the information that's in the
16 SPAR models for the level 1 stuff that we were looking
17 at, how many events are actually in that model, and
18 relating to initiating events and cornerstones, and
19 how many of them are ones that we would be able to
20 cover using RBPIs, and you can see that we have a
21 percentage of those inputs into the total SPAR model
22 that would get covered by RBPIs.
23 But, the more important one, I think,
24 which addresses the question that George raised, is
25 the next chart, and that one is, this is one that I

1 think addresses the question that came out earlier,
2 and that is, we went back to the IP database and
3 pulled out the dominant sequences for each of the
4 plants that we were working on here, and looked at
5 what was the general things that were important to
6 those sequences. And, what we've done is, we've drawn
7 a box around all the pieces of the sequence for which
8 we either have an RBPI from initiating events or
9 mitigating systems, or we have an industry-wide trend
10 potential information.
11 So, what you can see when you go down this
12 list is that most of the dominant sequences have one
13 or more pieces of them covered by an RBPI in this set
14 that we have looked at. So, that's a pretty warm
15 feeling to have, to know that you don't have a lot of
16 dominant sequences for which you've got no coverage at
17 all of your indicators.
18 CHAIRMAN APOSTOLAKIS: On the right, the
19 things you have boxed are part of the sequence, and on
20 the left the initiating events, what's going on there,
21 everything is boxed, but you have bold faced.
22 MR. MAYS: Well, we have two things. We
23 have bold ones were the ones we are directly having in
24 the RBPI indicators, the dotted lines ones under the
25 initiating event are the ones for which we don't have

1 plant-specific RBPIs, but we have industry trending.
2 CHAIRMAN APOSTOLAKIS: okay.
3 DOCTOR KRESS: I think industry trending is
4 a really good idea. I just don't see how it fits into
5 assessing the performance of an individual plant.
6 Will you touch on that after a while?
7 MR. MAYS: Well, this has to do with
8 something — yes, we will, we've got some stuff on
9 industry trending in a minute, but the short answer to
10 that is, if I have to go and determine what's
11 important at a particular plant, and I don't have a
12 plant-specific indicator for it, then I have to ask
13 myself, well, what do I know additional about it, and
14 one of the things I might know is, well, over the
15 industry this particular thing, which might be risk
16 important, has been going up over the industry, maybe
17 that's something I want to pay more attention to.
18 DOCTOR KRESS: It just raises your
19 awareness.
20 MR. MAYS: It raises your awareness.
21 CHAIRMAN APOSTOLAKIS: Increased monitor
22 attention.
23 MR. MAYS: And then also, if I have a
24 situation where I've seen a dramatic decrease in
25 something on an industry basis, then maybe I say to

1 myself, I don't need to spend as much time on my risk-
2 informed baseline inspection looking in those areas.
3 DOCTOR KRESS: But, what worries me there,
4 it's got compensatory errors, too, which bothers me,
5 some plants are going up and some are going down.
6 CHAIRMAN APOSTOLAKIS: See, that's his
7 concern.
8 MR. HAMZEHEE: But, we realize for this
9 event, though, Reactor Oversight Process, if it
10 happens once they are going to send a team to do a
11 root cause analysis, find out exactly what happened
12 and why it happened at a specific plant. So, this is
13 covered, but we don't have specific PI for it.
14 CHAIRMAN APOSTOLAKIS: But, you could also
15 do industry-wide trending for the stuff that you
16 monitor.
17 MR. HAMZEHEE: And, we are going to, yes.
18 CHAIRMAN APOSTOLAKIS: And, that's useful
19 information.
20 MR. MAYS: Right, we've got that in here,
21 too.
22 The next thing we talked about is —
23 CHAIRMAN APOSTOLAKIS: So, let's pick one
24 there on —
25 MR. MAYS: Okay. I'm trying to get you out

1 of here by 2:00, George.

2 CHAIRMAN APOSTOLAKIS: — sequence nine.

3 MR. MAYS: Okay.

4 CHAIRMAN APOSTOLAKIS: All the way to the

5 right, it says "HUM," is that human?

6 MR. MAYS: Yes.

7 MR. HAMZEHEE: Yes.

8 CHAIRMAN APOSTOLAKIS: So, there is a human

9 action there, presumably, a dynamic thing, right?

10 MR. MAYS: Right.

11 CHAIRMAN APOSTOLAKIS: During to the

12 accident.

13 MR. MAYS: Right.

14 CHAIRMAN APOSTOLAKIS: And, there's nothing

15 we can do about it, right?

16 MR. MAYS: Well, that's not true. What we

17 are saying is that, the good thing about this table is

18 that these are the pieces of that sequence for which

19 I have direct performance indicators.

20 CHAIRMAN APOSTOLAKIS: So, the baseline

21 takes care of it, baseline inspection.

22 MR. MAYS: There you go, the baseline

23 inspection and any subsequent inspections should be

24 covering those areas for which I don't have a direct

25 indicator.

1 CHAIRMAN APOSTOLAKIS: And, this is,
2 perhaps, NRR folks, this table, or a table like this,
3 it could be the basis for these tradeoffs that we
4 discussed earlier. If I put an extra performance
5 indicator somewhere, then I should reduce the
6 activities in the baseline inspection.
7 MR. MAYS: This is a similar concept which
8 —
9 CHAIRMAN APOSTOLAKIS: That's very useful,
10 this table.
11 MR. MAYS: — right, this is a similar
12 concept that was used for devising the baseline
13 inspections in the first place. They went back and
14 looked at some PRAs, some stuff that was and wasn't
15 covered in the —
16 CHAIRMAN APOSTOLAKIS: Not in such detail,
17 Steve, come on, not in such detail. I mean, it was a
18 general —
19 MR. MAYS: It wasn't in that detail, but
20 the concept is the same, and what this does is provide
21 more detail they could be able to use as a basis for
22 going back and potentially looking at the inspection
23 program.
24 MR. BOYCE: George, I think we agree
25 conceptually.

1 CHAIRMAN APOSTOLAKIS: Sure. No, I
2 understand.
3 MR. BOYCE: Well, the program has got to be
4 mature before we can really utilize the results with
5 any degree of confidence. We are not going to revise
6 our program based on preliminary results. I mean, we
7 are very interested in this sort of approach, and I
8 think in our initial comments, perhaps, even in that
9 aforementioned December 1st memo, we pointed out that
10 this was an area where we thought the program could be
11 very useful.
12 And, right now, there's a separate program
13 outside of risk-based PIs to utilize risk incites in
14 our inspection program, and we've got that initiative
15 going in parallel to this, but it's not as systematic,
16 it's not as robust and detailed as this program has
17 the potential to offer.
18 CHAIRMAN APOSTOLAKIS: Good. Good.
19 MR. MAYS: The next thing we had in the
20 report was, we did some what we called validation and
21 verification, and what we wanted to do was go back and
22 prove that we could actually do this thing and produce
23 PIs and evaluate against thresholds, and so we went
24 back and used the 23 plants that we had for the period
25 1997 through '99, and put the data to the test to see

1 what happened. And, when we did that on the next
2 page, what we found out when we looked at that, we
3 think we have a more precise accounting for the risk
4 significant design features of the plants. We know we
5 have more plant-specific thresholds, and we think we
6 have a better dealing of false exposure time. That
7 was one of the things we mentioned earlier, and we
8 have this kind of "face validity" approach that we are
9 taking to say, does this stuff make sense from a risk
10 perspective, once we've put this stuff through the
11 models and seen what comes out.
12 So, we've got some tables to show you, and
13 we do have one caveat that we want to make sure we put
14 in here. We haven't had all this data and these
15 models go through peer review, so if anybody were to
16 conclude that this is a definitive statement that some
17 plant is either green or not green, that would be a
18 bad conclusion, because that's not something we are
19 trying to do at this point in time.
20 So, under the initiating events, we take
21 the 23 plants that we had, we've gone through and
22 determined what the actual data shows, we've got the
23 values in there, along with in the parentheses what
24 the particular color would be for those initiators.
25 On the next –

1 CHAIRMAN APOSTOLAKIS: So, there are a few
2 whites there.
3 MR. MAYS: Yes, there are.
4 DOCTOR KRESS: Is this a good argument that
5 George can use to say that the previous use of the
6 95th percentile was not an appropriate way to go?
7 MR. MAYS: Well, we've made that argument
8 generically in the report.
9 CHAIRMAN APOSTOLAKIS: They agree, I think.
10 MR. MAYS: And, that's the earlier tables
11 where we were showing the 95 and the other one was
12 based on more than that.
13 DOCTOR KRESS: Right.
14 CHAIRMAN APOSTOLAKIS: It's interesting,
15 though, if you look at — I mean, there is a yellow
16 here.
17 MR. MAYS: Yes, that's correct.
18 CHAIRMAN APOSTOLAKIS: That's B&W Plant 5.
19 MR. MAYS: Uh-huh.
20 CHAIRMAN APOSTOLAKIS: Yellow on the
21 general transient, white on the loss of heat sink, and
22 green on the loss of feedwater flow.
23 MR. MAYS: Right.
24 CHAIRMAN APOSTOLAKIS: So, what would the
25 Action Matrix dictate now?

1 MR. MAYS: Well, again —

2 CHAIRMAN APOSTOLAKIS: That's beyond what

3 you are doing, right?

4 MR. MAYS: — that's beyond what we are

5 doing now, and in addition, for that particular plant,

6 we were going back, remember I said we were doing

7 "face validity," we were going back and checking

8 because that looked to be higher than what we are

9 seeing on other B&W plants, and we're going back to

10 see if there wasn't a modeling issue that was causing

11 that to be, and we are looking at that as well. So,

12 that was the reason for that caveat in the previous

13 slide.

14 When we go to the mitigating system

15 unavailabilities, we have a similar layout for the

16 plants there on the next two charts. The key thing

17 there was that, for example, on AFW/RCIC, depending on

18 which ones you are PWR, we broke out the motor-driven

19 pump and either the diesel-driven or turbine-driven

20 pump separately, because that was one of the things we

21 found, that currently we were averaging trains

22 together, and they have different risk implications.

23 So, when we looked at them this way, we saw that the

24 risk implications were different, and that gave us

25 part of that face validity that we think we are having

1 something that makes sense from our understanding of
2 risk.
3 We also have tables for the unreliability
4 of the plants, and in this case, just to make the
5 table a little more presentable, instead of going out
6 and calculating all the individual mean values for the
7 unreliabilities for those sections, we know that if
8 you go over a three-year period we have no failures,
9 and any number of demands, that the update is going to
10 be equal to or less than the baseline, and since the
11 baseline was below green there was no point doing
12 anything more for it. So, we just took a shortcut in
13 this table and put less than baseline for all the ones
14 where we had no failures.
15 Now, if you look at that, for example,
16 down at the bottom, the PWR list, the last one,
17 Westinghouse 4-Loop Plant 23, you'll notice that in
18 the AFW column there is a number in there, and the
19 value is 1.5E-2 for motor-driven pumps, and then it
20 has an indication of white. And then you notice again
21 down below it there's a number, .13, that was the case
22 where we had something that went over white, and so we
23 said there's only a 13 percent chance, based on how
24 far that distribution overlapped that threshold that
25 the actual value was still at the baseline.

1 So, if you were to have, you know, a high
2 number like .87 or something like that, then you'd
3 say, well, maybe this isn't quite a white threshold,
4 maybe this is just the uncertainty in the data, but
5 when you have a fairly low number there you are more
6 confident that you've crossed the threshold.
7 I want to skip the last one, unless you
8 have a particular question on it. We had the
9 component class scenario, and we did a similar thing,
10 if we had no failures we didn't calculate the actual
11 number, and when we did have a failure in that group,
12 we calculated a number and determined whether or not
13 it was green, white or yellow.
14 The thing we've kind of touched on
15 tangentially several times here has to do with
16 industry trending. When we originally started out
17 this program, we were considering industry trending as
18 part of an integral part of the PIs, and then as we
19 looked at it more we recognized that it was related
20 but not directly a risk-based performance indicator,
21 or at least not on a plant-specific basis. But, we
22 thought it was important to capture that there might
23 be risk-important events that occur, and risk-
24 important activities that occur, for which we can't do
25 a plant-specific indicator, and it needs to be

1 captured someplace, it just can't be left alone.

2 So, for those we looked at doing industry-

3 wide trending, and what we proposed for industry-wide

4 trending, both as an input to the ROP for those areas

5 for which you don't have direct indicators, well, if

6 you don't know the specific plants is the industry

7 getting better or worse, that's an important thing,

8 and also because we have a requirement in our

9 strategic plan to report to Congress whether or not

10 we've had any statistically significant adverse trends

11 in industry performance, so we viewed this information

12 as also being an important piece potentially to that

13 performance measure for the Agency.

14 So, what we proposed in the next table is

15 that we would have and develop, and they are in

16 Appendix A, I believe, is where most of them are, you

17 would be able to trend all of the proposed RBPIs that

18 we've already got in the report, as well as several

19 indicators that had frequencies that were less likely

20 to occur, and we grouped them in this table by the

21 cornerstones that they impact, and what we would be

22 able to produce in each of those areas. So, that's

23 what we've proposed as potential industry trends, and

24 some of that information is in the report.

25 I think we've spent a significant amount

1 of time so far already, by the way, talking about
2 several of these issues, and again, these are
3 implementation issues that this report and this
4 program is not going to directly address, because we
5 are really looking at the feasibility of putting
6 together indicators for the ROP, but we recognized
7 these were important things, so in our interactions
8 with the ACRS, and the public, and other people, as we
9 were going along, we wanted to raise these issues and
10 get people's thoughts going on them so that we could
11 know what the perspectives were before we got too far
12 down the road.
13 So, the first question was, well, do we
14 even need anymore indicators at all, or are we okay
15 with the set we've got now? Can we do everything we
16 need to do and still get by? I think the answer to
17 that is pretty clear. We believe that we can run the
18 concurrent Reactor Oversight Process and do an
19 adequate job. The question is, can we do better?
20 And, the stakeholders had different views.
21 The industry said, well, if we are going to get
22 greater sample and more PIs then we there needs to be
23 changes to the inspection program as well. So, our
24 position is that these are consistent with the policy
25 statement and the concept to try to use more objective

1 risk information in all areas possible, and the ROP
2 change process is where we are going to make an
3 assessment of whether or not they are worth it. I
4 can't tell you all the details of how that is going to
5 come about, but, I mean, that's where that — I can
6 tell you that's where the question goes to get
7 answered.
8 On the next one, the key issue was how
9 many PIs do you have? We have, potentially, you
10 could have, if you made swaps for like indicators and
11 new indicators, you could have in the ball park of
12 about 30 indicators per plant compared to the 18 that
13 the ROP currently has, and people are questioning,
14 geez, is that really an appropriate level?
15 Our position in Research is that the total
16 number of performance indicators should be
17 commensurate with the amount of risk coverage you want
18 to do by objective performance indicators, and that
19 number hasn't been determined, and that's kind of a —
20 there is no magic formula for calculating that,
21 there's no —
22 DOCTOR KRESS: It's a policy.
23 MR. MAYS: — it's a policy kind of thing,
24 and that's something that once we see how much
25 coverage the RBPIs have, with respect to what the

1 current ROP has from the indicator standpoint, and
2 what the desired mix is between the two, somebody can
3 come to that decision, but we believe that's the right
4 question.
5 DOCTOR KRESS: You just can't develop a
6 utility function for this, that's the problem.
7 MR. MAYS: Correct.
8 DOCTOR KRESS: And, that's what you need.
9 MR. MAYS: The next questions that come up
10 with implementation had to do with data sources, do we
11 have those data sources, do they have the required
12 quality in order to be used as part of the oversight
13 process? We believe that the key here is that the
14 data needs to be of sufficient quality so that if
15 there is an error in the data it's not going to change
16 your overall context of how you are going to view the
17 plant. So, for example, if somebody comes up and says,
18 well, I had reported 24.6 hours of unavailability in
19 my diesel and, in fact, you go back to the plant and
20 you found out that, wow, it was really 26, well, if 26
21 isn't sufficient to change your conclusion about the
22 plant we don't think that that's a level of precision
23 that needs to be part of the quality and the data to
24 do that. But again, this is another part of the
25 implementation issues that will have to get worked out

1 and we would expect that to probably get worked out
2 through a pilot program.
3 The next question that comes up has to do
4 with — the next two, in fact, have to do with models.
5 I had pointed out earlier that one of the main things
6 was, you have to have a model that has a reasonable
7 representation of the risk. I chose that word
8 carefully, because we've developed level 1 Rev. 3 SPAR
9 models for about 30 of the plants now, and we've got
10 a program to develop them for the rest of them.
11 The number of models' needs depends on the
12 level of plant specificity that you want to have. We
13 may be able to group things, we may want to do them in
14 plant-specific, but that's something that we have to
15 eventually come to a decision by.
16 And, the external stakeholders recommended
17 that if we were going to use SPAR models in this kind
18 of a process that they be reviewed by the licensees.
19 We agree with that. We've already been in the process
20 of taking several of our SPAR models on on-site
21 visits, and we have got plans to try to do that for
22 all the rest of them, because we believe it's
23 important to make sure that we are not, you know, out
24 in left field compared to what the plants have.
25 Now, we've done ten direct on-site visits

1 to review SPAR models, and on some occasions we found
2 that there were either equipment or procedures to deal
3 or mitigate with certain sequences that we didn't know
4 about, and then once we found out about them we
5 included them, and sometimes we've been to plants
6 where we've gone and they've said, holy cow, we think
7 our model needs to be fixed, your's is a better
8 representation of what's going on here. So, there's
9 a difference in the way that things are done,
10 depending on how long it has been since the plant has
11 updated their IPE, and what their groups are, but the
12 key for us is that with the SPAR models we have a set
13 of models in which we have a consistent methodology
14 for examining the same kind of information across
15 plants.
16 CHAIRMAN APOSTOLAKIS: And, this is not
17 just for this project, I mean, this will —
18 MR. MAYS: NO, this will apply to other
19 things in the agency, and I think that's an important
20 thing, also from a public confidence standpoint, that
21 I think we need to be able to say that we have
22 something that we look at that's independent of what
23 the licensees come and give us, so that we have the
24 ability to say we've done a critical look at what
25 they've presented to us.

1 The other advantage to us is that if we
2 have these models done this way, then we have the
3 ability when we have differences between their models
4 and our's to focus very quickly on what the basis for
5 the differences are rather than having to take a long
6 time to go over and review their model from complete
7 beginning to end.
8 CHAIRMAN APOSTOLAKIS: So, have the
9 licensees urged you to, in fact, have as the SPAR more
10 than their better IDs or PRAs? Some of the licensees
11 did a complete PRA.
12 MR. MAYS: That's correct.
13 CHAIRMAN APOSTOLAKIS: Have you seen any
14 desire on their part to have a SPAR model that you
15 have be the PRA?
16 MR. MAYS: Well, actually, what we found is
17 that, if we have significant differences between what
18 we have in our SPAR model when we go to a site,
19 between what they have, for example, in the core
20 damage frequency in our's, we sit down and say, what's
21 the differences, and if we find something in there
22 that is, well, we've put in this new system, or we
23 have installed these new procedures, or we've changed
24 the plant design from what you had here, we go back
25 and look at those things, gather that information, and

1 we make modifications to the SPAR models in light of
2 that.
3 CHAIRMAN APOSTOLAKIS: But, I understand
4 the SPAR models are sort of approximate, or is that a
5 wrong understanding?
6 MR. MAYS: I don't think approximate is the
7 right word to use.
8 CHAIRMAN APOSTOLAKIS: Can I put a complete
9 PRA, like full scope, the Seabrook PRA, can I put it
10 in a SPAR model?
11 MR. MAYS: Okay. The SPAR model stands for
12 Standardized Plant Analysis Risk, that's our
13 determination of the style and method of doing PRA
14 analysis and we apply it across all the plants.
15 However, the SAPHIRE suite, which is the
16 engine that allows you to run that, is capable of
17 taking a plant-specific PRA and putting it into it so
18 that you could do that.
19 Now, again, the problem there is, and we
20 have several plant-specific PRAs that are available,
21 Research has put those available in SAPHIRE, the
22 problem again there becomes, that just represents our
23 version, that gives us a model that represents their
24 PRA, and that one from the next one to the next one
25 may have different HRA assumptions, different CCF

1 assumptions, different modeling assumptions that they
2 put into the plant. So, while we have the actual
3 model in that case, we don't have a consistent basis
4 across them for examining what's happening. So, I
5 think SPAR models provide a different kind of benefit
6 to us, because we know that if we go and look at
7 Westinghouse 4-Loop Plant A and Westinghouse 4-Loop
8 Plant B, that if there's differences in the CDF
9 associated with those SPAR models it's because we've
10 determined something different about the plants, not
11 because we have different modeling assumptions.
12 So, we tried to limit the impact of
13 different modeling —
14 CHAIRMAN APOSTOLAKIS: And, the
15 Significance Determination Process will be based on
16 the SPAR models at some point?
17 MR. MAYS: The Significance Determination
18 Process that currently exists is based on the SPAR
19 models now.
20 CHAIRMAN APOSTOLAKIS: It is?
21 MR. MAYS: It's based on the ASP and the
22 SPAR models, that's how it was developed, and the
23 Significance Determination Process for Phase 3, where
24 we go out and do a more detailed risk analysis out of
25 it than what's in Phase 2, which is the table lookups,

1 in Phase 3 we actually go and put together a model to
2 look at that, and in most cases that uses the most
3 recent updated SPAR models we have.
4 CHAIRMAN APOSTOLAKIS: So, the tables that
5 are being used in the SDP are based on the SPAR?
6 MR. MAYS: Absolutely.
7 CHAIRMAN APOSTOLAKIS: All right, let's go
8 on.
9 MR. MAYS: A similar question relates to
10 the LERF models. We only have a limited number of
11 those available, and we only have a limited capability
12 to develop those in the short term, so the issue with
13 the LERF has to do with the RBPIs that there may be
14 some mitigating system components whose threshold is
15 set based on CDF, that when you consider LERF might
16 actually get different thresholds. So, we haven't
17 been able to do that yet, but we recognize that that's
18 an issue with respect to whether or not what these
19 represent the public risk with respect to the
20 thresholds.
21 So, let me get to the stuff which I really
22 wanted to talk to you about today, which was —
23 DOCTOR UHRIG: After lunch?
24 MR. MAYS: Maybe after lunch, if you want
25 to talk too.

1 CHAIRMAN APOSTOLAKIS: Maybe we should do
2 that after lunch.
3 MR. MAYS: Okay.
4 CHAIRMAN APOSTOLAKIS: We can't finish
5 everything before lunch.
6 MR. MAYS: No, so let me leave with you
7 with a taste of what it is. What we've done here —
8 CHAIRMAN APOSTOLAKIS: I want to go eat.
9 DOCTOR UHRIG: Let's have a taste of lunch.
10 MR. MAYS: You want a taste of lunch?
11 Okay, no problem.
12 CHAIRMAN APOSTOLAKIS: Okay, we'll be back
13 at 1:00.
14 (Whereupon, the above-entitled matter was
15 recessed at 11:49 a.m., to resume at 1:00 p.m., this
16 same day.)
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A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

(1:03 p.m.)

CHAIRMAN APOSTOLAKIS: Back in session, continuing with Mr. Mays and Mr. Hossein Hamzehee.

MR. HAMZEHEE: Yes, sir, correct.

MR. MAYS: Okay.

The thing we wanted to talk about next was some alternate approaches we've looked at in light of the comments that we had about the number of PIs being excessive or too many, and so what we went to do was relooked at what was the basis for doing these in the first place, and what we did originally was we devolved risks into smaller pieces, and we set all of our thresholds for risk-based PIs that are in the port at the level at which the data was being collected. So, if I had data on reliability, I had a threshold on reliability. If I had data on availability, I had a threshold on unavailability. And then, we looked at how much of an impact that changes in those values would have on accident sequence frequencies when we did that.

We took a slightly different approach, which I'm going to go through in these next figures and talk to you about, so let me just put the figures up and go through them. What we did was, we took the

1 accident sequences and we devolved them down into risk
2 areas at a more functional level, rather than at
3 reliability and availability of components, and then
4 we looked to find out what data we could do within a
5 particular functional group and then reassessed that
6 against our criteria for whether or not it was a good
7 PI.
8 So, if you start from – that's the wrong
9 title, it should be Industry Risks instead of
10 Individual, I'm sorry. But anyway, industry risk
11 comes from all the plants together and individual
12 plant risk comes from containment, core damage and
13 health effects things, and so underneath core damage,
14 which was where we were primarily looking, we looked
15 at what were the big pieces under initiators and
16 mitigating systems that might be amenable to a
17 slightly different approach, which would reduce the
18 number of PIs.
19 So, under initiators we said, well, we
20 might be able to group those into three groups,
21 transients, LOCAs and special initiators, and we list
22 some of the values, some of the types of initiators
23 that might go under that, for example, under LOCAs you
24 could have small, medium and large LOCAs, you could
25 have steam generator tube ruptures, you could

1 potentially have other ones like very small breaks or
2 inter-system LOCAs, things of that nature. And, under
3 mitigation we took the approach which is on the next
4 slide, which was we put together just kind of a very
5 basic functional event tree that's generally
6 applicable for anybody, for example, in a PWR where
7 you have an initiating event, your first issue is do
8 you establish reactivity control, then do you have
9 secondary heat removal. If you don't have that, do
10 you have feed and bleed, and then you have
11 recirculation, cooling. So, at that functional level
12 we were trying to see what we could do to do RBPIs.
13 And so, our concept is that what we would
14 do is we would develop functional impact models at one
15 of those levels and we would take the inputs for
16 reliability, availability and frequency that currently
17 apply to that functional level and use those as feeds
18 in together. Now, this is a case where we are having
19 a multi variate sensitivity study instead of single
20 variable sensitivity study. So, at the level, say, of
21 secondary heat removal, we take all the things that
22 impact secondary heat removal, put them into that
23 model, and see what that would change to the baseline
24 core damage frequencies that way.
25 So, when we did that, we came up with

1 three different kind of levels at which we could
2 potentially put indicators together. We could put
3 together an indicator, for example, at the cornerstone
4 level. So, if you went to the initiating event
5 cornerstone we could have an indicator that said this
6 is the impact of all the different inputs at this
7 cornerstone level together. We could do that also for
8 the mitigating systems, or we could go to the
9 functional level and have somewhere between three and
10 five indicators at a kind of higher order value, such
11 as heat removal, feed and bleed, those levels, or we
12 could go back down to the component and train level,
13 which is where we currently have stuff in the RBPI
14 report.
15 So, in looking at that, the way it would
16 look would be something like this. At the cornerstone
17 level, you would have, basically, two indicators. You
18 would have an indicator for initiating events, where
19 you would take the data associated with loss of
20 feedwater, loss of heat sink and general transients,
21 and you put them all together and run them through the
22 model and see what the output results was.
23 Now, what's different about this is that
24 in these cases, in all these functional cases, you
25 have the threshold being set at the output condition,

1 not on the input condition. So, currently in the
2 RBPIs we have a threshold for loss of feedwater, we
3 have a threshold for loss of heat sink, we have a
4 threshold for general transients, what we would do now
5 is take that data for all those data and say, what
6 would be the impact on the sequences for all of them
7 collectively. So, the threshold is now set on the
8 collective sequences, not any individual input.
9 So, you might, for example, have gotten
10 better on feedwater, or worse on heat sink, and
11 somewhere in between on transient, and you may or may
12 not get better or worse, depending on how that would
13 go. So, this is more like the integrated indicator
14 that we had talked about doing in Phase 2, but it's
15 not the complete total plant model version.
16 At the functional level, down from the
17 cornerstone level, we came up with two ways of
18 potentially doing this, and one was to take the
19 mitigating systems and group them by what initiator
20 they respond to. So, we would say, we'd take all that
21 data that we previously had in those 18 or 13 RBPIs
22 and we'd say, all right, which of that data when it
23 changes, how does that affect the transient sequences,
24 how does that affect the loop sequences, how does that
25 affect the LOCA sequences, and we just put them

1 through the entire model for all those things and see
2 what the impact would be.
3 DOCTOR KRESS: When you say how it affects
4 the sequence, do you mean how does it change the
5 sequence contribution to the CDF.
6 MR. MAYS: Right, collectively, together.
7 DOCTOR KRESS: Collectively, together.
8 MR. MAYS: Right. We take all, so in other
9 words we would take all the failure to start
10 information, all the failure to run information, all
11 the unavailability information for components that
12 affect loss of off-sight power sequences —
13 DOCTOR KRESS: So, your threshold would be
14 a delta CDF.
15 MR. MAYS: — a delta CDF for that
16 particular initiator.
17 DOCTOR KRESS: Uh-huh.
18 MR. MAYS: Or, that group of initiators.
19 So, that way we'd say, okay, the
20 mitigating system performance for transients is this,
21 it's green, white, yellow or red. The mitigating
22 system performance for loss of off-site power is this,
23 even though they'd be using some of the same data they
24 have different potential risk impacts. That's one way
25 to look at it. We'll show you some results of that in

1 a second.

2 The other way to look at it, which is a
3 little more like the current ROP, a little more like
4 the SSPIs and other stuff that INPO has, is to group
5 them by their function, their system functions. So,
6 for BWRs, for example, we would say we have RCIC and
7 HPCI systems that kind of do high pressure
8 performance. We have diesel generators. We have RHR
9 systems, we have what we've referred to as
10 crosscutting, which is those AOVs, MOVs and MDPs that
11 go across all the systems at the plant, we say we
12 could take that group and run them through the model
13 for all initiators, essentially, and see what the
14 combined impact of those is on the output.

15 So, we did that. We did a trial on that
16 to look and see what it looked like. So, let me show
17 you the first one we have, which is what would happen
18 if you did this stuff at the cornerstone level. We
19 took a BWR and a PWR plant that we previously have in
20 the report and we ran it through and said all right,
21 if we put, for the cornerstone level for the systems,
22 what we have here is that you take this particular
23 plant, and you take its data on diesels, on HPCI, RCIC
24 and RHR, all those together, and take all those
25 systems, all those inputs together and see how that

1 mitigation comes out, this particular plant comes out
2 to be white.
3 For the initiators, which is the next one
4 down, the initiator impact says it is green, so from
5 that particular plant we could come up with a white
6 for the mitigating systems and green for the
7 initiating event cornerstone, at that level.
8 And, we have a similar thing we've done
9 for Plant No. 23. Now, we didn't actually know these
10 were going to come out white and green, they could
11 have come out both green, or both white, or something
12 else, it just happened to be done that way. So, this
13 says I could actually come up with a value of what the
14 performance was at the cornerstone level, if I wanted
15 to do that.
16 Now, we'll talk in a minute about what the
17 advantages and disadvantages of doing that are, but
18 that's what we could have done at that level.
19 The next one I have to show you is if we
20 were to take the performance of the mitigating systems
21 and group their impacts by the initiating events for
22 which they are supposed to function. So, the first
23 case says, for the BWR plant, this says the front-line
24 systems, which is the RCIC, HPCI and RHR, as well as
25 the crosscutting component group, for LOCAs, for all

1 the LOCAs that would be applicable to that unit, the
2 performance for mitigating LOCAs is green. The
3 performance for mitigating losses of off-site power or
4 station blackouts is white, and performance for
5 mitigating transients is green. So, this gives you a
6 little more information than what you got a minute
7 ago. At the cornerstone level, you just knew
8 something was white, but you didn't know what. This
9 one gives you a little more detail. It says the thing
10 that's important at this plant is that this
11 combination of performance for all these systems is
12 most important in loss of off-site power sequences.
13 DOCTOR KRESS: This means that you take all
14 of your — you have to take all of your input data on
15 liability and unavailability and run it through —
16 MR. MAYS: Run it through the model.
17 DOCTOR KRESS: — the model at that point.
18 MR. MAYS: Right.
19 So now, this is different from what we had
20 done before.
21 DOCTOR KRESS: You ran the model.
22 MR. MAYS: Now, I'm using the model to run
23 the entire thing through to get the impact.
24 DOCTOR KRESS: To get the impact.
25 MR. MAYS: Because I can't do it correctly

1 — I mean, the advantage to the other ones —

2 DOCTOR KRESS: This takes care of my

3 problem.

4 MR. MAYS: Right, but it creates another

5 problem.

6 DOCTOR KRESS: Yes.

7 MR. MAYS: And, the problem it creates is,

8 before what we had was, we would set the thresholds by

9 using the model and then we'd just collect data and

10 compare the data to the thresholds, we didn't have to

11 go back through the model again.

12 DOCTOR KRESS: Exactly right, now you have

13 to go through the model every time.

14 MR. MAYS: Now I have to go back through

15 the model every time to do this, so that's a

16 difference, because I can't take into effect the

17 combined effects without putting it through the model.

18 DOCTOR KRESS: Yes, that's right.

19 MR. MAYS: So, this is more like the

20 integrated model.

21 DOCTOR KRESS: It's almost like the

22 integrated indicator.

23 MR. MAYS: You are right.

24 So, that's how you could do it if you

25 wanted to group the mitigating systems in accordance

1 with, for example, the initiator they respond to.

2 Another way to do it, which we have on the

3 next slide, is to do it by kind of the high-level

4 functions that the systems perform. So, for example,

5 again, the same plants, same two plants, what I see

6 now is that the electric power system for the BWR

7 plant, which would be these reliability and

8 unavailability combined now, is green, the HPCI, which

9 is the reliability and availability combined, would be

10 white, the RCIC is green, the RHR is green, and the

11 component groups is green. So, now I have a different

12 kind of perspective about the performance.

13 DOCTOR KRESS: But, none of this changes

14 the amount of reporting requirements.

15 MR. MAYS: RIGHT. This is with the stuff

16 that we already have, for the existing level we were

17 using for the RBPIs in the report, so we are using the

18 exact same data that we had in the report to do the

19 indicator a little differently.

20 So, let's, you know, having done that, and

21 you can see now you see that the thing that's causing

22 the station blackout loop sequences in the BWR plant

23 here to be high are the ones associated with the HPCI

24 system, not with the emergency power system, so

25 there's kind of advantages to going both ways if you

1 want to do that. So, we looked at what the potential
2 benefits of these things would be, and at the
3 cornerstone level the biggest benefit is, I've got a
4 single indicator. It's just, did this plant's
5 initiating event information and mitigation systems
6 that I'm monitoring rise to the level of having
7 performance that I'm concerned about. One indicator,
8 one time, see it. That's not too bad, and the other
9 advantage of this is that it takes into account inter
10 and intra-system impacts of changing in performance in
11 different areas, and we actually went back and looked
12 at this and we found, as we looked at the plants,
13 sometimes you would have things that were, say, in an
14 individual indicator, it was green and white, you put
15 them together in a combined thing and they turn out
16 green, or sometimes we'd find it went the other way,
17 there would be a white and a white, and you'd put them
18 together and it turns out yellow, or you find things
19 that are green and green and they turn out white, or
20 two whites end of turning – I mean, you see variation
21 depending on which sequences particular inputs are
22 involved with.
23 DOCTOR KRESS: Now the question I might
24 have is, what's the down side of doing all of these?
25 MR. MAYS: Of putting it all together?

1 DOCTOR KRESS: Doing all of them.

2 MR. MAYS: That's another — that's another

3 thing you could potentially do. Let me get to that in

4 a minute.

5 DOCTOR KRESS: Okay.

6 MR. MAYS: The limitation, of course, is

7 that once you find something that's not green

8 performance, you don't really know directly what it is

9 that's causing it so that you can go out and find out

10 what you need to spend regulatory attention on. It's

11 not very precise in telling you what's the particular

12 area that needs to be dealt with.

13 If you go to the functional level, well,

14 the benefits are we have fewer indicators, instead of

15 18 or 13 we are now talking about three, four, five or

16 six, depending on how you want to use these. This

17 also accounts for intra and inter-system impacts, and

18 it can be grouped either by major types of initiators

19 or by system functions, or if you wanted some other

20 way of looking at it you could postulate one and we

21 could do that.

22 The limitations of this is, now when I

23 have them broken down into functional groups, I now

24 have to have some way of bringing them back together

25 to make my assessment of whether the cornerstone was

1 degraded or not, because they don't directly tell me
2 the entire cornerstone picture. And, I still have the
3 situation where if I have greater than green
4 performance I still have to do more work to figure out
5 why it was greater than green. I may know it's in the
6 HPCI system, but I don't know if it's the availability
7 or the reliability, I've got to go back and do some
8 more looking before I can figure that out.
9 DOCTOR KRESS: That's why I was asking why
10 not do all of them?
11 MR. MAYS: Well, you are getting to the
12 thing.
13 The last one I had was, if you do it at
14 the component or train level, like the current RBPIs,
15 the biggest advantage here is this is the broadest
16 evaluation of individual attributes, and the causes of
17 greater than green performance are pretty obvious once
18 you've got it at that level. I know it's diesel
19 generator reliability, or I know it's AFW diesel-
20 driven pump train reliability or its availability. I
21 know the area much more precisely when I have the most
22 broad individual indicators, and it's much more
23 similar to the current indicators because the
24 indicator data and the thresholds are set and I don't
25 have to do running through models anymore, I just pick

1 up the new data and compare it, away I go.

2 The limitations are, the inter and intra-

3 system dependencies aren't accounted for here. So,

4 sometimes you get worse and sometimes you get better,

5 depending on what the risk relationships are on the

6 accident sequences, and if you have them at an

7 individual variate level you don't see that.

8 Now, the disadvantage also is it nearly

9 doubles the number of current PIs that we have, and it

10 requires you to set an individual plant-specific

11 threshold on lots of different indicators.

12 DOCTOR KRESS: But, it doesn't double the

13 quantity of data that you need collected.

14 MR. MAYS: It's the same amount of data.

15 DOCTOR KRESS: Same amount of data.

16 MR. MAYS: Exact same data.

17 So, that's the kind of stuff that we've

18 looked at as potentials, so we are looking for

19 feedback.

20 Now, one of the things that you mentioned

21 that you could do is, you could say, well, if you are

22 going to take all that data and run it through the

23 model, either at some lower level, intermediate level,

24 or up to the cornerstone level, well, why not do it at

25 all of them and just have one of them be the one you

1 report out to the public, and utilities and everybody
2 else, and the other ones be the ones that you use as
3 subsidiary things to go back and see what was causing
4 it to be the way it is. That's a possibility. We
5 haven't really done much more than have some
6 preliminary discussions with NRR, because we just got
7 finished running some of these examples, as to what
8 one they think would be the best.
9 So, what we intend to do is try to get
10 your feedback on where you think we should go. We are
11 going to talk about this at the public meeting next
12 week, to see if people think that this is a good idea
13 that they would prefer or not, then once we get your
14 comments and their comments we are going to sit down
15 with NRR and we are going to say to ourselves
16 collectively, what makes the most sense to do and
17 publish in the Phase 1 report, which should be out in
18 November. So, we will have a kind of meeting of the
19 minds at that point, and we'll say, based on the
20 comments we heard, and our own internal discussion,
21 this is the way we think we should go. So, this
22 report could be dramatically changed if we decide to
23 go at a different level. If it's decided to throw
24 away the component level then this report would
25 certainly change, or if it's decided to do it at multi

levels this report will change, but we have to come to that decision after we get some comment and feedback.

I think what I wanted to make sure you understood today was we have the ability to do this in different ways, and we are looking for feedback as to what people think would be the best way to go.

And, we'll take those comments and we'll go from there.

So, what we are looking for the ACRS to give us feedback on, again, is whether they think these represent potential benefits to the ROP or not, whether they think this technically is an adequate job of how you would go about defining and calculating these things, and whether or not the alternate approaches we just discussed here are something that's worth pursuing or not, or whether it's something to be not done until Phase 2, or done as part of Phase 1, or where you think that kind of stuff should go.

So, I'm pretty confident that we have information that uses readily off-the-shelf PRA tools and methods, that uses readily available and accessible data to us, that we can put together broader and more plant specific performance indication for potential use in the ROP. And, at that point if we've got that, we'll hand this off to our friends

1 over at NRR, who can then go through the
2 implementation process, and where we will have to
3 answer the questions like can we actually get this in
4 the plants, what's it really going to cost to get this
5 data, are we willing to use these models, do we want
6 to instead use the plant-specific models from the
7 licensees by giving them some specification and using
8 those? I mean, those are all possible questions that
9 could get answered through the implementation, and I
10 don't want to minimize the fact that those are serious
11 questions and will require some serious work to make
12 it happen, but I think as long as we keep in the mind
13 set of progress, not perfection, and is this a valid
14 incremental improvement or potential improvement, then
15 that's where we want to be at the end of the day.
16 So, I guess the only other thing we have
17 is, if there's something – I guess we have to hear
18 from Tom.
19 CHAIRMAN APOSTOLAKIS: Let's hear from Tom,
20 and then –
21 MR. MAYS: About what you want us to
22 present to the full committee.
23 CHAIRMAN APOSTOLAKIS: – we'll do that
24 after we hear from Tom.
25 MR. MAYS: Okay.

1 CHAIRMAN APOSTOLAKIS: So, Nuclear Energy
2 Institute, please go.
3 MR. HOUGHTON: The ball moved down the
4 field, so I decided to take notes and talk from them.
5 The first thing is, the Nuclear Energy
6 Institute and the industry is very interested in risk-
7 based performance indicators and trying to move
8 forward in having the process be more risk-based as we
9 can. Of course, the caveat always – and I think Steve
10 has done a real good job in working through this and
11 raising a lot of the issues in the analysis he's done,
12 and a number of things he's done address problems that
13 are problems with the current program, which I want to
14 talk to you about.
15 But, the caveat, of course, is that it
16 needs to be considered in the context of the ROP, and
17 what the purpose of the ROP is, and the performance
18 indicators. The performance indicators are meant to
19 be used to help the NRC determine how much inspection
20 it's going to do above the baseline inspection, and
21 how it assesses plants and how it engages in
22 enforcement of plants.
23 Our feeling is, if there's no reduction or
24 efficiency improvement in inspection, that it's
25 difficult to understand why we would put additional

1 effort into generating performance indicators.

2 Now, one could say that a lot of this

3 information is gathered under the Maintenance Rule and

4 under internal performance indicator gathering, and it

5 is. The problem comes, is that we move from, gee, I

6 think that was a loss of feedwater initiating event

7 to, my inspector is coming in and he's looking in a

8 manual and he's making a decision for which I can be

9 cited for a violation of the regulations in my

10 reporting, or it involves a long-winded process of

11 trying to resolve weather the issue counts or not, or

12 whether the hours count or not.

13 We've had on the order of about 260

14 frequently asked questions over the course of the

15 program so far, and these involve sometimes matters of

16 15 minutes of unavailability. So, the devil is in

17 these details, and as we expand the number of PIs it's

18 not just we might have some of that data, the question

19 is, is it worthwhile the extra effort that has to go

20 into that. That was one point.

21 We support a stable, consistent and

22 improving system of performance indicators, which Mike

23 Johnson talked about and Steve talked about, in terms

24 of the change process. I suspect that some of your

25 questions that I heard today are, why aren't we

1 thinking about some of these implementation or use
2 issues at this stage, rather than finishing up the
3 whole Phase 1 effort and then turning it over to NRR.
4 Unfortunately, to determine that this indicator
5 doesn't provide us additional value or a P process, or
6 that it's too difficult to explain to the public what
7 you are working about, because you are talking a more
8 sophisticated type of indicator, particularly, as I
9 was hearing if we went to a cornerstone level
10 indicator I think that would be more difficult to
11 understand, as opposed to a shutdown or an
12 unavailability.
13 So, we would – and we support piloting
14 these. There are a number of pilots going on now.
15 There's one going on about the SCRAMs and the loss of
16 normal heat removal. There's one that's going to go
17 on to try and revise problems with the power changes
18 that will be piloted soon. And, the results, the
19 purpose of these pilots, as you were asking, is,
20 really, is it easy to understand what the indicator
21 is, is it easy to report it without making errors, and
22 is it more efficient in terms of inspection, is it
23 more focused on risk-significant issues, those are the
24 sorts of things that we want to see coming out of a
25 performance indicator so that it's of value to both

1 the NRC and to the industry.

2 A couple of comments on the initiating

3 event PIs. I think plant-specific goals are a good

4 objective, however, when you look at the range of data

5 it may become difficult to explain to the public or to

6 understand as a licensee the fairness of one plant

7 getting extra inspection if they had two general

8 transients, two SCRAMs, and another had seven. Okay,

9 that just — you know, a SCRAM is not a good thing, and

10 if you had such a disparity, even at the green/white

11 level, that's a question to raise as to, what does

12 that mean to the public, what does that mean to the

13 licensee.

14 Loss of heat sink, I may be wrong, but I

15 looked at added up over a three-year period, and for

16 one of the plants it was a .7 transients per three-

17 year period. That means if you had one loss of heat

18 sink you would go into the white category. I don't

19 understand that. I think it shows the limitations of

20 risk-based versus risk-informed and how we have to

21 look at what we mean in terms of implementation here,

22 not just what does it mean in the risk model, but what

23 does it mean in the implementation world.

24 Also, a yellow for three SCRAMs, general

25 transient SCRAMs in a year, would not be very

1 appropriate to do.

2 Mitigating systems, the biggest issue we
3 are having now is unavailability. That is a real
4 problem. It's causing a lot of gnashing of teeth
5 among system engineers who have to go out and do the
6 Maintenance Rule one way, and the INPO indicator the
7 other way, and the ROP another way, and their PRA
8 person has a different way. So, we are working on
9 that, and I think a lot of the things that Steve is
10 working towards, reliability, not counting fault
11 exposure, are good things that we want to work, and we
12 really want to work on them faster.

13 CHAIRMAN APOSTOLAKIS: But, there is
14 resistance of changing these things and coming up with
15 a uniform set of definitions, which is a mystery to
16 me. I mean, this is the third time that I recall this
17 committee facing this issue, of what is reliability,
18 what is availability, and so on, and every time we
19 recommend that we need a White Paper with consistent
20 definitions, and every time we get something, we'll
21 think about it.

22 It's a very thinking agency here.

23 MR. HOUGHTON: Well, we got started with
24 the kick-off meeting amongst key players a month ago.
25 We have another meeting in May, and anything you can

1 do to support putting focus on this —

2 CHAIRMAN APOSTOLAKIS: Well, I don't know

3 what to do. What should we do, Steve, to give focus?

4 Do you guys want to come before the committee? You

5 don't have to, you are industry, but I wrote a long

6 memo with four or five definitions, when was this —

7 MR. HOUGHTON: Of course, we have to —

8 CHAIRMAN APOSTOLAKIS: — was it A.D. or

9 B.C., I can't remember.

10 MR. HOUGHTON: — we have to satisfy a

11 number of interested parties. There's the Maintenance

12 Rule, which has its set of rules and the way it's been

13 doing things. You know, and that's a rule.

14 We've got PRA practitioners and they way

15 they look at things. We've got the INPO/WANO system,

16 okay, which they've been very good, in that they will

17 defer to the ROP definition, because they feel it's

18 more conservative. Okay. And, we have the ROP.

19 We have a basic underlying issue, which

20 is, in unavailability it's to be used to help

21 inspectors decide how much to inspect. Okay.

22 Inspectors inspect design-basis tech specs, allowed

23 outage times. The best definition we can come up with

24 is going to be more risk-based and oriented, okay, so

25 there's an important issue there that needs to be

1 addressed. So, it's not trivial to do this.

2 CHAIRMAN APOSTOLAKIS: I don't know what

3 the best way is. I mean, we'll leave it up to you how

4 you want to involve the committee. We can ask the

5 staff to come here, we can't ask you to come here.

6 MR. HOUGHTON: Well, I mean, we are happy

7 to come and talk and participate. I'm just —

8 CHAIRMAN APOSTOLAKIS: It's something maybe

9 you can coordinate with Mr. Markley.

10 MR. HOUGHTON: It might be appropriate for

11 someone from the staff from NCR —

12 CHAIRMAN APOSTOLAKIS: Will you be ready in

13 May when we have the full committee meeting to address

14 this issue, or is too soon?

15 MR. HOUGHTON: Well, we can lay out some

16 parameters of what we think the definition ought to

17 move towards.

18 CHAIRMAN APOSTOLAKIS: Well, let's do that.

19 MR. HOUGHTON: Okay.

20 CHAIRMAN APOSTOLAKIS: In May, that will be

21 Friday, May 11th, at 2:30, we are discussing — we have

22 an hour and a half on risk-based performance

23 indicators. Maybe that would be a good place to

24 start.

25 MR. MAYS: George, let me interject a

1 little bit here if I may about that. We've been
2 working for a long time with the folks down in INPO
3 and EPIX stuff, and there was an NEI industry task
4 group to try to deal with this problem of different
5 data being collected different ways, to be reported to
6 five or six different entities, and what the
7 implications of that were. And, this is something
8 we've seen along the way.
9 What we found is that, the definition of
10 unavailability isn't so much the problem. The problem
11 tends to be the definition of the unavailability
12 indicator that you are using, because you know as well
13 as I do the unavailability definition from a classical
14 PRA or reliability definition is not that big of a
15 deal, but what happens is, when you start taking into
16 account other factors, such as, well, could the person
17 have restarted it or realigned it very quickly? You
18 take into account the factors, well, are we talking
19 about the automatic or the manual feature? You take
20 into account, well, are we talking about meeting its
21 design-based intent or its risk-significant intent?
22 There really isn't a real problem with getting the
23 amount of hours a piece of equipment is taken out of
24 service is not available, the performance function, we
25 have that data in various different varieties all over

1 the industry. The trick is to try to gather that
2 information sort of in its lowest common denominator
3 form and then create a kind of expert systems or smart
4 systems that will take that and use that information
5 to do the kinds of indicators that you want, depending
6 on who and what you want to look at.
7 For example, INPO wants to give credit to
8 plants that have more trains than they need to have
9 from a regulatory standpoint, so they can take those
10 trains out of service. So, they want to let them have
11 more unavailability. So, the way they do it is, they
12 define the unavailability indicator that doesn't
13 include those unavailable hours.
14 But, if you are doing a PRA, and you are
15 saying, what's the likelihood that these three trains,
16 instead of the two that are required, are going to
17 work or not, you need to know the unavailability of
18 all the three trains.
19 So, I found, and what I've seen, is that
20 the problem is not so much the definition of the
21 unavailability per se —
22 CHAIRMAN APOSTOLAKIS: Unavailability,
23 though, there is a problem with the definition.
24 MR. MAYS: The problem we've seen, and I
25 think the problem we've run into in the Reactor

1 Oversight Process, is whether we are talking about
2 risk significant or design-basis function, whether we
3 are talking about auto or manual, whether we are
4 talking about how much credit you can take for being
5 able to realign or automatically resume.
6 MR. HOUGHTON: And, what system cascades to
7 what system.
8 MR. MAYS: Right.
9 And so, those are, in my opinion,
10 indicator definition problems, more so than
11 unavailability definition problems. And, what we've
12 seen is, I think, that there's a way to get to that
13 through common terms and definitions from a database
14 standpoint that will help a lot of these out.
15 CHAIRMAN APOSTOLAKIS: Well, the concept of
16 reliability is defined differently too, but, fine, I
17 mean, if we have a single document that explains all
18 these things, and comes up with a set of consistent
19 definitions, says that certain things are really
20 indicator problems rather than definitions, but right
21 now there isn't such a thing. So, I am all for it, to
22 develop something like that.
23 MR. HOUGHTON: As Steve was saying, there
24 is an industry consolidation group that's looking at
25 having a virtual database, which you can pluck

1 different data elements, common data elements from.
2 So, we are working that.
3 We are also working to meet again, I
4 think, about a week after your meeting with the key
5 players again from both industry and NRC, both
6 Maintenance Rule, PRA, ROP type people, so that we can
7 work towards these common data elements, so that we
8 don't have to waste our time fighting that.
9 CHAIRMAN APOSTOLAKIS: Okay, great. So,
10 you can brief us next time on the activities.
11 MR. HOUGHTON: Okay.
12 MR. BOYCE: NRR is also on that working
13 group, so that we also agree working towards common
14 definitions is the correct goal. In our most recent
15 public workshop for the Reactor Oversight Program last
16 week of March, that was one of the things we tried to
17 work towards, and we got a lot of input, but it's hard
18 to bring all those different organizations to a common
19 definition for many of the reasons that Steve just
20 said, they have different purposes for the use of the
21 data, but we are working on it, we are trying to get
22 there.
23 CHAIRMAN APOSTOLAKIS: All right.
24 MR. HOUGHTON: Shutdown indicator, I think
25 it's a good effort, good start. However, at this

1 stage I don't think it passes the simple intuitive
2 capable of easy use that we need for a performance
3 indicator. It may be that it has greater value as a
4 Significance Determination Process, rather than as a
5 performance indicator per se.
6 I haven't had enough time to study the
7 details of it, but it looks a lot more difficult than
8 one would put on a public web site or that one would
9 base —
10 CHAIRMAN APOSTOLAKIS: Which one is this
11 now?
12 MR. HOUGHTON: The shutdown indicator.
13 CHAIRMAN APOSTOLAKIS: Oh.
14 MR. HOUGHTON: Let's see, I guess the last
15 — Steve brought up, this is the first time I saw the
16 alternate approach. Certainly think on it, but I
17 think one of the principles we started with was, is
18 that aggregating the information to higher levels was
19 really counter to what the concept of doing the
20 performance indicators was, rather than have
21 aggregation to cornerstones or some higher level we
22 feel that the indicators ought to be as close to the
23 reality of what's going on the plant and be
24 actionable, such that we would say that having a SCRAM
25 indicator pass a threshold is actionable. You can

1 look at your SCRAM reduction program. Having a
2 particular system exceed a threshold allows you to go
3 focus first on that system and then do your root cause
4 and extent of condition, and look and see if it
5 applies elsewhere in the program.
6 So, we really feel that the program is
7 best left at a more granular level, in terms of
8 actionable level, in terms of performance indicators.
9 Now, that might mean a few more additional performance
10 indicators, we certainly would be willing to trade off
11 something workable in reliability as opposed to the
12 fault exposure, which has caused a lot of problems.
13 I guess my last point is, we look forward
14 to making the program better. We know it can be
15 better. I think, as I said a few minutes ago, a very
16 important part of these performance indicators is the
17 interface at the inspector level and how they view the
18 design basis versus the risk basis, which I think
19 Steve has talked — also talked about, okay, which is
20 not — it's not a trivial thing to change that mind
21 set, and it's the whole mind set in terms of all of
22 risk-based regulation versus the deterministic that we
23 have now.
24 Thanks.
25 CHAIRMAN APOSTOLAKIS: Thank you very much.

1 Maybe we can discuss now for a few minutes
2 what the presentation in May will consist of. Should
3 we go around the table and see what the members are
4 interested in?
5 Graham?
6 MR. LEITCH: I have a question for Steve,
7 if you don't mind.
8 CHAIRMAN APOSTOLAKIS: Sure.
9 MR. LEITCH: Just before we get into that.
10 I'm coming away with the impression that
11 the risk-based performance indicators are almost by
12 definition, by the criteria used to determine whether
13 you can establish a risk-based performance indicator,
14 they are almost by definition a lagging indicator, and
15 that most of the leading indicators you can't really
16 draw a distinct correlation between those indicators
17 and risk.
18 I guess I thought you were going to tell
19 us at one point an example of a reactor that got into
20 trouble and going to try to back fit what the risk-
21 based performance indicators would look like and see
22 if it gives you any warning, any clue of impending
23 difficulties.
24 MR. MAYS: Those are both good questions.
25 Let me address the leading/lagging issue.

1 We tried to do that a little bit in the RBPI White
2 Paper discussion, and maybe we weren't as clear as we
3 need to be. The question, when you ask yourself about
4 leading and lagging indicators is leading and lagging
5 of what? I think you can see from the way we have
6 broken down risk from plant risk to the things
7 affecting containment, CDF and health effects, and
8 what are the things that affect CDF, I think you can
9 make the case that, for example, diesel generator
10 reliability, although that data is lagging of diesel
11 generator reliability, is leading of core damage
12 frequency, which is leading of public risk. So,
13 that's the perspective I have with respect to leading
14 and lagging.
15 Now, the issue about what are the causes
16 of those things to happen, I don't have really good
17 models right now to put in a risk perspective to say
18 the causes applied to reliability was getting worse or
19 availability was getting worse was this an aspect to
20 the way the plant is run, managed or operated? I
21 don't have that information. That would be even more
22 leading than what I have now.
23 But, I think we've made the case in the
24 White Paper that the combination of the fact that
25 we're looking at things that contribute to core damage

1 frequency, which contributes to public risk, makes
2 what we are doing leading, and, in fact, the
3 thresholds that we've chosen for those at the levels
4 we've chosen for them are significantly below the
5 existing public risk from all causes that relate to,
6 for example, early fatalities, that we have a pretty
7 good system of making sure we have a sufficient margin
8 built into the system so that even if we don't have it
9 completely down right we are not going to have gross
10 enough errors to really have a big impact on public
11 risk as compared to what we currently have for
12 accidental death rate.
13 So, from that standpoint I feel pretty
14 comfortable with the leading/lagging nature of what we
15 have.
16 As we've shown here, if you want to get
17 more leading, or you want to hit higher level
18 indications, you have to do more aggregation and you
19 have to do more work of that nature.
20 The other issue, I think, with respect to
21 those, is that when you go back and look at how you
22 are getting the data and where you are setting the
23 thresholds, whether you are setting it at the input
24 point, or whether you are setting the thresholds at a
25 higher level, also affects what your leading or

1 lagging perception was.

2 I'm not sure I answered both of your

3 questions or not.

4 MR. LEITCH: Well, I guess the second one

5 had to do with, is there any evidence that if you use

6 the risk-based performance indicators, and tried

7 somehow to go back and back fit that to any of the

8 nasty events that we've had, is there any correlation

9 at all? And, I guess as long as it hasn't been core

10 damaging –

11 MR. MAYS: That's one of those good

12 news/bad news things. The bad news is, is we can't go

13 back and relate this to actual core damage events, the

14 good news is, we can't go back and actually relate

15 this to core damage events.

16 MR. LEITCH: Yeah, right.

17 MR. MAYS: So, no, but one of the things

18 that we've looked at, and one of the things we've done

19 in the Reactor Oversight Process, was the question

20 becomes is, what constitutes poor performance, and

21 really when we were working on the ROP there really

22 wasn't a standard that you could compare against as to

23 what constitutes poor performance, other than things

24 like the watch list, or people who are on the INPO

25 trouble list or whatever. So, the ROP process went

1 back and looked at the current sets of indicators and
2 said, do these have good or reasonable correlation
3 with the plants that we have historically known to
4 have bad performance, and they had some data, and they
5 went back and did some analysis to say, these look
6 like they are reasonable, the bad performers tend to
7 fall out when we go back and look at the historical
8 data.
9 The problem from risk-based performance
10 indicators is, I don't have data back into that realm
11 to make that — I have two problems, one, I don't have
12 data on all these things back into the realms of the
13 1970s, '80s and early '90s, that I can compare these
14 to, to see whether they map out who were the "problem
15 plants," and I'm not even sure that the "problem
16 plants" were necessarily the worst ones from the risk
17 perspective either.
18 So, I have a problem on two levels. One
19 is the ground truth level and one is data to compare
20 it with.
21 MR. LEITCH: Yeah.
22 MR. MAYS: One of the things we did do, and
23 have done in looking at this, is we went back and
24 said, well, if the ROP was reasonable maybe we can go
25 back and take RBPIs over a similar period and look at

1 what the ROP did and see if we are coming up with
2 similar results or significantly different results, or
3 if we find differences do they make sense to us from
4 a risk perspective? And, that's what I meant by that
5 "face validity" comment.
6 DOCTOR KRESS: You still need to pick a
7 period you have the data for.
8 MR. MAYS: You need to pick a period where
9 you have comparable data for both processes, and the
10 best we can do right now is probably the '97 to '99
11 time frame.
12 DOCTOR KRESS: Right.
13 MR. MAYS: We've taken a brief look at
14 that, and I think we found that we do a pretty
15 reasonable job of correlating with some of the stuff
16 that was in the ROP. We have more information that
17 they don't have, so you can't really compare what they
18 don't have to what we do have.
19 But, we did, we were able to go and look
20 and see where we found differences, and if it made
21 sense to us that the differences should exist, and the
22 kinds of things we found were, we found sometimes that
23 the RBPIs would have whites or yellows where the ROP
24 currently has greens or whites, and we looked at why.
25 And, when we looked at that, the most common reason

1 was because we were using plant-specific thresholds,
2 as opposed to generic or group thresholds.
3 We also found some cases where the ROP
4 would have whites or yellows, and we've had either
5 greens or whites, and we went back and looked at those
6 cases and what we found in those cases generally had
7 to do with things associated with the false exposure
8 time, when you take the false exposure time into
9 account in more of the way you would normally do it in
10 a risk assessment, and take into account the
11 reliability indicator portion, we found some of those
12 problems tended to go away.
13 But, we have gone back and looked at all
14 of those, and the other thing we found was the design
15 basis thing. If you were reporting unavailable
16 because it couldn't do its design basis function by
17 automatically starting, but was still capable of
18 manually starting, our indicators would indicate that
19 that was not a degradation as severe as the current
20 ROP would.
21 So, we've looked at that, but we haven't
22 published a formal side-by-side comparison like that,
23 and I'm not sure that there's anything we could do
24 anymore rigorously than a general comparison like that
25 in the first place.

1 Now, maybe if we were to go through this
2 and pilot some of these, what you would do is you
3 would run through the pilot with RBPI portions, and
4 you would run through and see what the comparison
5 would have been with the ROP, and then you go back and
6 ask yourself that "face validity" question again which
7 says, does it make sense that I'm having differences,
8 and do I believe that the differences are risk
9 significant? If you find that, you find that to be
10 something, as you said earlier, George, of benefit
11 that you want to do as a regulatory agency, then that
12 might be what you would do there. But, I think that's
13 part of looking at the stuff through the
14 implementation process.
15 DOCTOR KRESS: I hate to say this, because
16 it goes against my grain, but I think this is one of
17 those cases where your technical process itself is so
18 sound that I don't think you need to validate it
19 through real experience. I hate to say that, because
20 that's contrary to my usual belief.
21 MR. MAYS: I think you need to make the
22 case why what you have makes sense.
23 DOCTOR KRESS: Makes sense, it makes such
24 good sense, I don't think anymore validation than
25 you've already done is much worthwhile, because you

1 are validating against things that are not validated
2 themselves against reality.
3 MR. MAYS: It's a problem of where do you
4 find ground truth to compare it to.
5 DOCTOR KRESS: Yeah, so, you know, I
6 wouldn't search too much for more validation.
7 MR. MAYS: Well, we haven't done anymore
8 than that.
9 CHAIRMAN APOSTOLAKIS: Can we address the
10 issue of what to do?
11 DOCTOR KRESS: Of what to do?
12 CHAIRMAN APOSTOLAKIS: Yeah.
13 DOCTOR KRESS: Do you want to go around the
14 table?
15 CHAIRMAN APOSTOLAKIS: Yeah, tell us if you
16 —
17 DOCTOR KRESS: Well, in the first place, I
18 think you need to tell us in general what the process
19 is, what you've done, but I would also be sure to get
20 to the three options that you talked about, because I
21 think it's very important that the full committee hear
22 about those.
23 I would talk about how you dealt with
24 shutdown, because it's significantly different than
25 the normal rest of the process, and I would go just a

1 little bit into the validation effort, comparing it to
2 the '97 data to '99 data, but not a lot. I wouldn't
3 spend a whole lot of time on that.
4 And then, I would point out this — yeah,
5 I would point out this principle you are using,
6 progress versus perfection, and talk about things you
7 may improve in the future, because I think those are
8 questions that are going to come up.
9 So, that would be my opinion, George, on
10 what I think.
11 CHAIRMAN APOSTOLAKIS: Bob?
12 DOCTOR UHRIG: Well, I have the sense here
13 that what you are doing tends to validate the system
14 that is in place now. Am I stating that properly,
15 that you are getting comparable results to what you
16 are getting from the inspections that are going on —
17 MR. MAYS: From the indicators that
18 currently exist.
19 DOCTOR UHRIG: — yes.
20 MR. MAYS: I think we are getting
21 comparable readings in a number of areas. We are
22 getting more readings where they don't have readings
23 now, and where we have differences we know what the
24 basis for the differences are.
25 DOCTOR UHRIG: I think that should be

1 indicated, not on elaboration, but simply that's the
2 additional thing that I would add to what Tom has
3 suggested here.
4 CHAIRMAN APOSTOLAKIS: Graham?
5 MR. LEITCH: This last piece you covered
6 after lunch, the potential of the RBPIs went by me
7 awful fast. Frankly, I don't really understand what
8 was said there. I didn't have a chance to look at it
9 in advance, so I need some time to brush up on that,
10 but I think once more through that section, just a
11 little more slowly, might be helpful to the committee.
12 CHAIRMAN APOSTOLAKIS: Good.
13 Mario?
14 DOCTOR BONACA: Yes, I pretty much agree
15 with the other points. Just a couple of things. One
16 is, you know, this is really a good effort, a good
17 visibility study of RBPIs, I mean, and to stress the
18 fact that, you know, the ROP is something different,
19 and, ultimately, there may be changes to that
20 depending on how well some of these RBPIs compare with
21 the existing ones.
22 The second point, the one that Graham
23 pointed to, it went very fast, and yet there is a lot
24 of merit on some of the alternatives, although I'm not
25 saying that they are going to be the likely one.

1 And, the third one is just a point I would
2 like to make, is that I think there is a more
3 systematic approach than it shows in the way we went
4 about this. I got the impression at the beginning
5 that you were saying, well, you know, whatever is
6 feasible we choose, and whatever cannot be done we
7 just don't go with it. I don't think you said that,
8 and I think that somehow I got a message, and maybe
9 you can communicate, that you have a systematic
10 approach. You are looking at containment, you are
11 looking at all the functions, and you do believe the
12 two that you could possibly identify there are already
13 significant of themselves and compare with the ones
14 you have right now whatever you have in the other side
15 program. I think that's important, because I didn't
16 get that message at the beginning.
17 CHAIRMAN APOSTOLAKIS: Okay, and we can
18 have another, I guess, of a little bit like you did
19 today.
20 MR. BOYCE: It sounds like I'm on tap.
21 CHAIRMAN APOSTOLAKIS: Yeah.
22 MR. BOYCE: Can I just –
23 CHAIRMAN APOSTOLAKIS: Maybe over some of
24 the issues that were raised regarding that memo.
25 MR. BOYCE: – yes, I think comment number

1 seven is still down there, although I was still hoping
2 Steve had addressed your concern during the course of
3 the conversation.
4 CHAIRMAN APOSTOLAKIS: The full committee
5 probably needs to hear it.
6 MR. BOYCE: I was unsuccessful.
7 I did want to take, if I could, just a
8 second just to address some of the things that I heard
9 here, and give you a little bit bigger picture on, I
10 think, where NRR is coming from.
11 CHAIRMAN APOSTOLAKIS: Next time, not now.
12 MR. BOYCE: Well, I wanted to leave you
13 with just a general thought, if I could.
14 CHAIRMAN APOSTOLAKIS: Okay, go ahead.
15 MR. BOYCE: And, it relates to the tone in
16 that memo, as you pointed out, it was cool. The
17 approach I think we have is, is that – the view we
18 have is that this project is ambitious, but it's
19 clearly in step with the Agency's direction to become
20 more risk informed, and so we support that, but we
21 have to be very, very cautious because we can't right
22 whole sail into this and then have some sort of
23 problem come up, like the SPAR models have a fatal
24 flaw, the licensees do not want to submit data to EPIX
25 anymore, and, therefore, the performance indicators

1 may not be valid anymore.

2 So, we are very conscious of the burden

3 that it places on licensees and the public acceptance

4 part of it. That's part of our performance goals, is

5 to enhance public confidence. And so, those sorts of

6 intangibles tend to get factored into technical

7 decisions on should we proceed with the risk-based PI

8 program, and that's why we are cautiously supportive

9 of this program.

10 CHAIRMAN APOSTOLAKIS: Okay, and that's

11 certainly something we want to discuss with the full

12 committee.

13 And, I also want to scrutinize Appendix F,

14 and discuss this issue of how the aleatory

15 uncertainties are handled, but other than that I think

16 we are in good shape. We had a good presentation

17 today, good discussion, we appreciate it. Thank you

18 very much, gentlemen, all of you.

19 DOCTOR KRESS: Once again, a very good

20 confident job and good presentation.

21 CHAIRMAN APOSTOLAKIS: Yes.

22 DOCTOR KRESS: Thank you very much.

23 CHAIRMAN APOSTOLAKIS: Nothing less is

24 expected of these guys.

25 DOCTOR KRESS: Yes, you know, we ought to

1 be raising the bar every time you guys come in,
2 because —
3 CHAIRMAN APOSTOLAKIS: Yeah, it's over,
4 it's over, the subcommittee meeting is over.
5 (Whereupon, the above-entitled matter was
6 concluded at 1:55 p.m.)
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