

Official Transcript of Proceedings
NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards
Reliability and PRA Subcommittee

Docket Number: (n/a)

Location: Rockville, Maryland

Date: Friday, October 19, 2012

Work Order No.: NRC-1966

Pages 1-153

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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RELIABILITY AND PRA SUBCOMMITTEE

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FRIDAY

OCTOBER 19, 2012

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ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear
Regulatory Commission, Two White Flint North, Room
T2B3, 11545 Rockville Pike, at 1:00 p.m., John W.
Stetkar, Chairman, presiding.

SUBCOMMITTEE MEMBERS:

JOHN W. STETKAR, Chairman

DENNIS C. BLEY, Member

JOY REMPE, Member

WILLIAM J. SHACK, Member

ACRS CONSULTANT:

MARIO BONACA

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NRC STAFF PRESENT:

JOHN LAI, Designated Federal Official

MARY DROUIN, RES

ANDERS GILBERTSON, RES

MARK RUSSO, NRO

ALSO PRESENT:

JEFF LaCHANCE, Sandia National Laboratories

GARETH PARRY, ERIN Engineering

MARY PRESLEY, EPRI

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24
25

TABLE OF CONTENTS

Opening Remarks 4

Electric Power Research Institute (EPRI)

 Presentation - Draft EPRI Report 10265116

Staff Presentation - Revised NUREG-1855 Rev 1 . . .119

Member Discussion 149

Adjournment 153

P R O C E E D I N G S

1:01 p.m.

1
2
3 CHAIR STETKAR: The meeting will now come
4 to order. This is a meeting of the Reliability and
5 PRA Subcommittee. I'm John Stetkar, Chairman of the
6 Subcommittee meeting. ACRS Members in attendance are
7 Dennis Bley, Bill Shack, and Joy Rempe. Our
8 consultant, Mario Bonaca, is also in attendance.
9 John Lai of the ACRS staff is a Designated Federal
10 Official for this meeting.

11 The Subcommittee will hear discussion of
12 EPRI Draft Report 1026511, practical guidance on the
13 use of PRA in risk-informed applications with focus on
14 the treatment of uncertainties. We'll also hear the
15 staff's discussion of the revised draft NUREG-1855,
16 Revision 1, guidance on the treatment of uncertainties
17 associated with PRAs and risk-informed decision-
18 making.

19 We've received no written comments or
20 requests for time to make oral statements from members
21 of the public regarding today's meeting. The entire
22 meeting will be open to public opinions. The
23 Subcommittee will gather information, analyze relevant
24 issues and facts, and formulate proposed positions and
25 actions, as appropriate, for deliberation by the full

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1 committee.

2 The rules for participation in today's
3 meeting have been announced as part of the notice of
4 this meeting previously published in the Federal
5 Register. A transcript of the meeting is being kept
6 and will be made available, as stated in the Federal
7 Register Notice. Therefore, we request that
8 participants in the meeting use the microphones
9 located throughout the meeting room when addressing
10 the Subcommittee. The participants should first
11 identify themselves and speak with sufficient clarity
12 and volume so they may be readily heard.

13 We'll now proceed with the meeting. And,
14 Mary, I don't know if you want to say anything first.
15 Mary Drouin.

16 MS. DROUIN: Mary Drouin with Office of
17 Research. Well, we're just glad to be back, and we're
18 continuing to move forward. We think this is a very
19 important document and supporting risk-informed
20 regulation. You know, how to deal with uncertainties
21 just is one of the key pieces.

22 CHAIR STETKAR: Mary, just for the benefit
23 of the Subcommittee members that are here, could you
24 just briefly tell us what your plans are for the NUREG
25 anyway, in terms of the near-term --

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1 MS. DROUIN: Right now, we have just
2 issued, before we can send something out for
3 publication, we need to give a two-week advanced
4 notice to our program offices. So the two-week
5 advanced notice letter is being issued right now as we
6 speak, so I would anticipate that this will be out in
7 the next two to three weeks. For public review and
8 comment, we'll go out for 60 days, so we expect to
9 have the public comments in January and then to issue
10 this final in February.

11 CHAIR STETKAR: Great. Thank you. With
12 that, I guess we'll turn over the meeting to EPRI.
13 Mary?

14 MS. PRESLEY: Hi. I'm Mary Presley from
15 EPRI, and I'm here with Gareth Parry from ERIN
16 Engineering. Let's just jump right in. So the first
17 couple of slides you've seen at the last meeting we
18 had, so I'll go through them fairly quickly so we can
19 spend some time on the actual technical details.
20 Quick overview of the project history and our points
21 of collaboration with Mary Drouin's team and then an
22 overview of what's in the new guidance, and we'll
23 actually step through some of those sections and then
24 discuss our next steps.

25 So the EPRI report is complimentary

1 guidance to the Revision 1 of 1855 that's coming out.
2 And, previously, the Revision 0 of 1855 had a
3 complimentary document, EPRI 1016737, that came out
4 together. And that document --

5 MEMBER SHACK: The telltale heart.

6 CHAIR STETKAR: Ignore it.

7 MS. PRESLEY: Okay. Oh, there we go.

8 CHAIR STETKAR: Just as long as our
9 recorder can hear okay, that's the important thing.

10 MS. PRESLEY: So that previous document
11 focused on providing some guidance on the state of
12 knowledge correlation, particularly using experiences
13 to describe when it's important, how to look for it,
14 and how to assess it. And, also, there was some
15 sections on characterizing model uncertainty.

16 The guidance on state of knowledge
17 correlation is untouched. We're leaving that in
18 1016737. And in this new document, we're going to
19 update some of the model uncertainty discussion, which
20 we'll discuss later.

21 CHAIR STETKAR: Mary, why, you know -- I
22 can understand documents, but why didn't you simply
23 update 1016737? Right now, there's some separate
24 information in 1016737, there's some separate
25 information in whatever the new one is; I've forgotten

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1 the number already --

2 MS. PRESLEY: 10267 --

3 CHAIR STETKAR: -- and there's some
4 overlap, and some of the overlap is the same and some
5 of the overlap is morphed a little bit. Does it not
6 create confusion for users, especially in the overlap
7 and morphing areas?

8 MS. PRESLEY: We tried to map it out in
9 the front of our new document. I think it was a
10 matter of convenience more than anything to have this
11 new document be an update because people are already
12 --

13 CHAIR STETKAR: Or why didn't you bring
14 the state of knowledge correlation stuff into the new
15 document and just surplus the other one?

16 MS. PRESLEY: We could have.

17 CHAIR STETKAR: I mean, you would have
18 had, you know, the state of knowledge correlation in
19 one place, you would have had the new thoughts of
20 model uncertainty, the tables in terms of the internal
21 events model uncertainty issues. I mean, you know,
22 that's just copy and paste. That's production stuff.
23 It just seemed confusing to me to have the two of
24 them, especially with overlap and disjoint things.

25 MS. PRESLEY: I understand. That's a fair

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1 comment. We kind of went back and forth on that. We
2 didn't want, we wanted people to read the new guidance
3 and be aware of what the new stuff was.

4 CHAIR STETKAR: Yes.

5 MS. PRESLEY: And we were a little bit
6 worried that if we poured all the old stuff in, the
7 new stuff would get lost. It was kind of six of one,
8 half dozen of the other, but we'll consider that
9 comment again, only --

10 CHAIR STETKAR: I mean, I just think of
11 people having to work from two documents. If they
12 were absolutely mutually exclusive, you know, I could
13 rationalize that. But given overlap and some
14 additional elaboration, especially in the area of
15 modeling uncertainty compared to the older one, it
16 just, you might want to think about that.

17 MS. PRESLEY: It may make sense to port
18 that over. That was also a public comment we got.

19 CHAIR STETKAR: Oh, was it?

20 MS. PRESLEY: So we'll consider that. I'm
21 not sure, at this point --

22 MR. PARRY: I'm not sure whether we can do
23 it and meet the schedule, but maybe we could consider
24 doing that at a later date, EPRI could consider doing
25 that at a later date just to combine them.

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1 MEMBER BLEY: It just seems for the poor
2 folks out in the field trying to use this --

3 MR. PARRY: I know.

4 MS. PRESLEY: Yes.

5 MEMBER BLEY: -- it's going to be tough
6 for them.

7 CHAIR STETKAR: It's also a lot easier
8 going forward, one would think, that if there's any,
9 I hate to say this with the staff present, but if
10 there are any future revisions to things, and you want
11 to point to updates of methods or something like that,
12 trying to keep two documents coordinated that are
13 referred to from a NUREG or guidance or whatever, this
14 is prone to problems.

15 MS. PRESLEY: Right. Originally, they
16 were mutually exclusive. They were two separate
17 documents. And then we decided, oh, this chapter four
18 seems to be really applicable and we need to update
19 parts of it, so we ported it over. That's where the
20 lines started blurring, but it's a fair comment.

21 MR. PARRY: I think there's another
22 comment that you could also make as to why we have an
23 NRC document and an EPRI document when they're dealing
24 with the same thing and cross reference --

25 CHAIR STETKAR: Well, I was going to ask

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1 Mary that, but since you brought it up . . .

2 MR. PARRY: No, I mean, like the fire --

3 CHAIR STETKAR: Yes, why not?

4 MR. PARRY: -- PRA project, for example.

5 CHAIR STETKAR: Why not? And there have
6 been a few NUREGs issued. I mean, the fire isn't the
7 only one. There have been others issued.

8 MR. PARRY: Right.

9 CHAIR STETKAR: I'll ask the staff. Mary
10 can answer that because I'm sure that decision was
11 made somewhere.

12 MS. PRESLEY: So the previous work also,
13 as you know, has a list in the appendices of generic
14 model uncertainty for internal events --

15 CHAIR STETKAR: At-power.

16 MS. PRESLEY: At-power, yes.

17 CHAIR STETKAR: As opposed to internal
18 events at shutdown, which isn't a new one.

19 MS. PRESLEY: Yes. So internal events at-
20 power. And that, of course, built on prior EPRI work,
21 which is 1013491.

22 CHAIR STETKAR: Or internal events
23 contribution to Level 2, which isn't a new one.

24 MS. PRESLEY: So we've been working with
25 the NRC under an MOU, and there's two particular

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1 points of cooperation in this project. One was to
2 take the stages, the steps that 1855 Revision 1
3 defines and really provide some concrete guidance on
4 how to apply those steps and where the iteration
5 points are, some of the nuance of how you use those
6 steps in an iterative process to put together a
7 license application and perform that analysis. And
8 the second part was, to produce the appendices, we
9 worked with the NRC, we had a joint workshop where we
10 brought experts in on fire, seismic, low-power
11 shutdown, and Level 2. So those were the two main
12 points of collaboration and, obviously, we were
13 involved in reviewing each other's documents and
14 making sure that there was one coherent story.

15 CHAIR STETKAR: Is it fair to now
16 characterize, since Appendix A has been deleted from
17 1855 and subsumed in Appendix A now of the new report,
18 is it, from a user's perspective, is it fair to kind
19 of characterize 1855 as what ought to be done and the
20 EPRI documents as guidance for how to do it?

21 MS. PRESLEY: It's kind of a user's --

22 CHAIR STETKAR: Or is it not that --

23 MS. PRESLEY: -- guide.

24 MR. PARRY: Yes, it's kind of like that,
25 I think.

1 CHAIR STETKAR: Okay.

2 MR. PARRY: I mean, that was the intent
3 was to not necessarily reproduce all the techniques
4 and stuff that's in 1855 but to show how they fit into
5 a license --

6 CHAIR STETKAR: So if I'm a user, I
7 basically pick up the EPRI documents and I have
8 confidence that if I follow the template that's there,
9 if I can call it that, I'll satisfy the NRC's need to
10 quantify uncertainties?

11 MR. PARRY: One would hope so.

12 CHAIR STETKAR: Okay.

13 MS. PRESLEY: And we have --

14 CHAIR STETKAR: I'm just trying to --

15 MR. PARRY: Yes. I mean, that would be
16 the intent.

17 CHAIR STETKAR: I'm trying to get down to
18 real practical things. I'm not trying to be --

19 MR. PARRY: No, no, no, that was --

20 CHAIR STETKAR: -- as simple as I'm
21 sounding. I want to understand how somebody out in
22 the field, a PRA practitioner, will understand how
23 this process works. Will they have confidence when
24 they pick up this document that that, indeed, will
25 satisfy the regulatory needs of the NRC in terms of

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1 what they need to do to develop a, you know, a risk-
2 informed application with appropriate treatment of
3 uncertainty, and they don't need to go to other
4 guidance.

5 MR. PARRY: Right.

6 CHAIR STETKAR: They don't even need to
7 read the NUREG in principle.

8 MR. PARRY: Right. I think that's
9 correct. But I think the only caveat I would have is
10 that there's no guarantee that an application would be
11 successful because there could be disagreements, the
12 sources of uncertainty for example, on their
13 characterization.

14 CHAIR STETKAR: Yes, but those are
15 technical --

16 MR. PARRY: Those are technical things,
17 right.

18 CHAIR STETKAR: Those are specific
19 technical issues, like you didn't model this valve or
20 something like that.

21 MR. PARRY: Right.

22 CHAIR STETKAR: But in terms of the basic
23 process and the methods that are used --

24 MS. PRESLEY: I would say that, with the
25 caveat that there's a lot of good detail in 1855 that

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1 we don't replicate. We've mapped, we give an
2 overarching framework of how to do the assessment, how
3 to use those steps. And then we refer to specific
4 sections that give detail on how to specifically do
5 parts of the analysis. So we don't replicate. It's
6 really, they're really complimentary. They're
7 supposed to be used, I think, more or less, together.

8 MS. DROUIN: Both NRC reports, well, the
9 NRC report and the EPRI report are supposed to be, as
10 Mary said, complimentary. There was very little
11 duplicate effort in the reports, so you really need
12 both of them. We had, you know, at one point, was
13 going to put the detailed example in 1855. After a
14 lot of discussions with EPRI, it did make more sense
15 that it belonged better in the EPRI report because
16 that's really where the examples are really given and
17 the detailed guidance that supports the high-level
18 guidance of what the staff expectations are that's in
19 1855.

20 MS. PRESLEY: And I'll give you just an
21 example of what I mean by we give a broader framework
22 and they provide the details. In our document, we
23 talk about how you need to make sure you have the
24 right hooks in your PRA model to model the change that
25 your -- but then we referred to 1855 where they

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1 provide a rather lengthy list and discussion of what
2 those hooks are, internal events, basic events, like
3 where you look to find those hooks.

4 So this is really the process and the
5 framework, and we map it against the steps in 1855.
6 And then 1855 flushes out some of the technical
7 details.

8 CHAIR STETKAR: Okay. I'll have to think
9 about that.

10 MS. PRESLEY: So, hopefully, that will be
11 more clear when you see the flowchart.

12 CHAIR STETKAR: Okay. I'll let you
13 continue.

14 MS. PRESLEY: So the new guidance really
15 is intended as the nuts to soup --

16 MR. PARRY: Backwards.

17 MS. PRESLEY: Soup to nuts?

18 MR. PARRY: Soup to nuts, yes.

19 MS. PRESLEY: Thank you.

20 CHAIR STETKAR: It's okay. Either way
21 works.

22 MS. PRESLEY: I eat desert first. Yes,
23 soup to nuts approach of --

24 CHAIR STETKAR: You can start making fun
25 of the way he talks, too.

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1 MS. PRESLEY: Thank you. I'm just
2 surprised he didn't point it out to me earlier because
3 it was written on my sheet and he saw it. Okay.
4 Anyways, starting with the PRA that you have and
5 incorporating the changes that you need and doing the
6 screening and pulling out the key risk drivers and key
7 sources of uncertainty and then how do you decompose
8 and interpret your results to find out what those key
9 things are, how do you do sensitivity analyses, where
10 do you look, that sort of thing. And then we provide
11 the graded approach on now you have your
12 uncertainties, you've assessed it against these
13 regimes that are defined in 1855, well, how do you
14 really determine which regime you're in and then what
15 do you do once you figure that out?

16 And then, once you've done all that and
17 you have your quantitative assessment complete, how do
18 you package that together to produce a story that
19 really describes that you have a wholistic
20 understanding of what the risk is and what the
21 uncertainties are? And part of that is dealing with
22 large uncertainties.

23 So that's what the core of the document is
24 about, and then we provide an example implementation,
25 which is Appendix A, which, as you know, was what was

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1 planning to be in 1855 prior. We've moved it over
2 here because we referenced it so heavily, it made more
3 sense to put it in this document. And then we added
4 four appendices for the expanded tables on generic
5 modeling uncertainties for seismic, fire, low-power
6 shutdown, and Level 2.

7 So where we are with the document, I'll
8 talk about this a little bit further in next steps,
9 but we've sent out our document for public comments
10 for users' group and also to Mary's group and have
11 received those comments back. And the majority of the
12 comments were in areas of clarification where we were
13 being a little vague or at least not entirely clear.
14 And then you'll see some of -- we've tweaked the
15 document a little bit. That flowchart is one of the
16 areas where we've tweaked it, and you'll see some of
17 those things as we go through the slides. And I think
18 Gareth will point out areas where we've made some
19 changes in response to those public comments because
20 you got the draft that went out for public comment.
21 So that's the -- okay.

22 So I'll go ahead and hand it over to
23 Gareth Parry from ERIN Engineering.

24 MR. PARRY: Okay. Thank you, Mary. Yes,
25 one of the things that I think we hadn't really made

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1 clear when we put the document together what our
2 ingoing assumptions were. So the next couple of
3 slides make that a little clearer, and you'll see, as
4 Mary said, that we changed the process diagram to
5 reflect the comments that we had from the commenters
6 that said but what about this situation?

7 So what we wrote this for was for guidance
8 for licensees who want to make a risk-informed
9 submittal in accordance with guidance documents, such
10 as Reg Guide 1.174, not necessarily that one
11 specifically. But as you know, all the risk-informed
12 application documents tend to rely on that, at least
13 in terms of the philosophy of the integrated decision
14 making and the principles. So that's one going-in
15 position.

16 And, in general, most of those submittals,
17 when you read the guidance documents, they require
18 consideration of all the contributors to risk with a
19 few exceptions. Sabotage is typically excluded. But,
20 significantly, they generally require that you look at
21 all hazards and all POS's, except, of course, for very
22 specific things, like NFP 805 where you're looking
23 specifically at fires.

24 Now, we recognize that, currently, there
25 are very few, if any, licensees that have full-scope

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1 PRA. I mean, there may be a couple that have, but,
2 generally, they do not. So we developed the process
3 to facilitate the screening or bounding of the missing
4 scope items from, the items that are missing from the
5 scope of the PRA. So the process is designed to do
6 that, and it compliments to what the discussions in
7 1855, which also has a whole chapter on bounding and
8 screening of hazards.

9 Clearly, this, I think, was the part that
10 perhaps was missing from the original document that
11 you can bypass these steps if you have a full-scope
12 PRA or if the PRA that you have is adequate for the
13 application. The application only requires that
14 scope. The other thing we wanted to put in here in
15 the document, it's a little separated from the process
16 itself, is we wanted to explore a little bit of the
17 interplay of the principles of risk-informed
18 regulation, particularly the principle that talked
19 about the limit, the size of the change that's allowed
20 in terms of the change in risk, and the defense-in-
21 depth principle because that has been a little
22 problematic in terms of the way it's been interpreted.

23 So, in general, we would expect to be
24 starting out with a PRA that, as a minimum, addresses
25 internal events and internal flooding as hazard

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1 groups. We also expect that the base PRA will have
2 been peer reviewed against the ASME standard and Reg
3 Guide 1.200 Rev 2, so that the technical adequacy of
4 the base PRA is understood, we know if there are any
5 problems associated with it. And the only comment to
6 make about that is that really only addresses the base
7 PRA. Clearly, you'd have to come back to look at the
8 technical adequacy of certain aspects of the PRA that
9 might be specific to an application.

10 So there's an iterative approach here, but
11 the document doesn't really get into that. That's, if
12 you like, parallel activity that you'd expect the
13 licensee to be doing to ensure the technical adequacy.
14 We didn't think this was the right place for looking
15 at that.

16 Okay. So now if we look at the figure,
17 you'll notice that this is different from the figure
18 that appeared in the draft document in which you had.
19 And the difference is in the first little diamond on
20 the left-hand side that says PRA model adequate,
21 instead of going to step three, now it clicks up and
22 asks the scope question. So this is a bypass of the
23 screening and bounding part of the process if you know
24 that the PRA model you have going in is of sufficient
25 scope to deal with the specific application. And this

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1 could happen if it's a full-scope PRA or, say if
2 you're only dealing with fires, that it's a fire PRA.

3 So those are the only, that's the only
4 difference in the figure, except also that these nice
5 little bubbles on here which indicate which steps of
6 the 1855 process are addressed by these particular
7 steps. So rather than talk through the figure at this
8 point, I'll go through the steps one by one, if that's
9 okay.

10 Okay. Steps one and two. These are,
11 essentially -- there's absolutely nothing new here.
12 This is the standard stuff that everybody should be
13 doing if they're doing risk-informed application.
14 They've got to understand what guidance documents
15 they're using, which means that they have to have
16 understood the acceptance guidelines; which risk
17 metrics are being used and how they're to be used;
18 which hazards and plant operational states have to be
19 considered. That's the overall scope. There's the
20 comment again that some applications can be hazard
21 specific; and, therefore, that's very clear in that
22 case. And in some cases, the cause/effect
23 relationship is also specified in the guidance
24 documents. In some of those documents, it tells you
25 what it is you need to do to model the impact of the

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1 change. It may not always be the case for things like
2 Reg Guide 1.174. If it's not one of the standard
3 applications, you may have to search for the way to
4 model the change.

5 And step two is, effectively, it's an
6 assumption that you're staffing with the PRA that you
7 have, whatever the scope is, and you're looking at
8 that model to see that it has the right hooks to model
9 the cause/effect relationship. So it has to have the
10 right elements for you to be able to model the change
11 that you're assessing from a risk perspective. And
12 this is NUREG-1855 Stage B. So this is just to remind
13 people that that's where you have to start.

14 Okay. Step three we put in as -- and
15 you'll see this in the way that the example in
16 Appendix A of our document is developed. You have a
17 PRA, so you're going to do an initial comparison of
18 the PRA results for the acceptance guidelines. This
19 is essential if the scope of the PRA doesn't address
20 all the risk contributors required by the acceptance
21 guidelines. If the scope is, in fact, adequate, then
22 you really don't need to do this, although you might
23 do this as part of step five.

24 The advantage that you get out of doing
25 this is that the -- there's two things really. One is

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1 that the quantitative results you get from that give
2 you an indication of the margin that you have to the
3 acceptance guidelines, so it's a good place to start
4 to see if you've got a hope of meeting the guidelines.
5 But perhaps the more important thing, well, definitely
6 the more important thing is that when you look at the
7 results and you analyze them, you'll get an indication
8 of which initiating events, which accident sequences,
9 which functions, systems, components are important for
10 determining the risk metrics that you're going to be
11 using to make the decision. So it's a detailed
12 qualitative understanding of what's driving the risk
13 metrics, and you need this to be able to do the
14 screening and bounding analysis in step five. You
15 need it in any case in the end when you do step four,
16 the screening and bounding. You'll need it also in
17 step five.

18 So one of the things that we put in the
19 document, and it's in chapter three of this document,
20 is, and I'll come back to it a little later on, is a
21 description of the hierarchical process for analyzing
22 the results of the PRA, to dig deep and understand
23 where the contributors are coming from, and also to
24 understand the level of detail, if there's any
25 conservatism or anything associated with it. We can

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1 come back to that a little later.

2 Okay. Step four. The purpose of step
3 four is to give guidance on how you can assess the
4 adequacy of the scope of the PRA you have. So the
5 idea is to look at the missing scope items and
6 investigate, given that you have understood from step
7 three what are the important initiating event
8 sequences, functions, etcetera, whether you can
9 explore whether, based on that knowledge, you can
10 either screen the hazard group, the missing hazard
11 group of PRS out or whether you can bound its
12 contribution to the risk metrics in some ways.

13 Because there's no universal way of doing
14 this, things are going to be different, depending on
15 the application and the plant and the PRA. We can
16 only give general guidance at this point. What
17 Appendix A does, it gives specific examples of
18 approaches that were used for the particular plant for
19 which Appendix A was developed. So you'll see, for
20 example, in that appendix there's what we call a
21 bounding analysis for the seismic. It's bounding in
22 the sense of the path of the earthquakes on the plant
23 is bounded, not necessarily frequency. So you can't
24 argue that it's bounding overall. The frequency of
25 the earthquakes is considered to be that which

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1 everybody agrees on, more or less, given that there's
2 a lot of uncertainty on it. But at least there's an
3 accepted frequency of the earthquakes, so the bounding
4 in that case is bounding on the impact.

5 Now, if neither of these can be
6 demonstrated, i.e. that you can't screen or you can't
7 bound, then you have a problem, at least a short-term
8 problem. Either you can construct a PRA model which
9 could be fairly time consuming and probably resource
10 intensive or, if possible, you could also change the
11 way the change you're proposing is to be implemented
12 at the plant and restricted in such a way that the
13 contributions for the missing scope items become
14 negligible.

15 Okay. Now, step five. Once you're
16 satisfied that the PRA you have has a sufficient scope
17 and/or the missing scope items have been effectively
18 bounded by some calculations and demonstrated to be
19 bounded, then what you do is you do the final
20 comparison with the acceptance guidelines. And this
21 really hasn't changed very much, but it's described in
22 chapter four of this report. It follows, largely, the
23 guidance in the previous EPRI document.

24 What is different, though, is in the
25 latest version of NUREG-1855 NRC has introduced these

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1 regimes where they effectively represent a graded
2 approach to the review and the level of detail of the
3 argument you'd have to make to demonstrate that you've
4 met the guidelines. So what we've included in this is
5 a sort of graded approach to addressing uncertainty,
6 depending on where the point estimate lies.

7 CHAIR STETKAR: Let me ask you about that
8 because I was going to, dependent on who came up
9 first.

10 MR. PARRY: Okay.

11 CHAIR STETKAR: You came up first so . .
12 .

13 MR. PARRY: We got the short straw.

14 CHAIR STETKAR: Why is it that I should
15 care more about uncertainty only because I'm in regime
16 three? Why shouldn't I care about uncertainties that
17 I've not evaluated that could give me a measurable
18 probability of being in regime three when I thought I
19 was in regime one and a half because of very large
20 uncertainties?

21 MR. PARRY: Yes, I don't think we've
22 precluded that.

23 CHAIR STETKAR: Certainly, you've not --
24 well, you don't preclude anything. You're very
25 careful about not precluding. I'll come back to my

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1 original comments now. If I'm out in the field as a
2 practitioner and I read this guidance, I read this
3 guidance to say I don't need to worry about
4 uncertainty unless I'm in regime three.

5 MR. PARRY: No.

6 CHAIR STETKAR: I'll tell you, that's the
7 way I read it.

8 MR. PARRY: Okay, okay.

9 CHAIR STETKAR: So if you don't want it to
10 be read that way, you ought to rewrite it.

11 MR. PARRY: I'm sure we will. I think
12 what we say is --

13 CHAIR STETKAR: Now, I get the same
14 impression, by the way, from the NUREG, so Mary is
15 going to have to answer that one, also.

16 MR. PARRY: Well, I think what we say is
17 that, as far as parametric uncertainty, we don't
18 really care when they're in regime one and probably
19 not in regime two because we're low enough. But we do
20 say in the document that you really have to look at
21 the model uncertainties even in regime one because
22 they could shift you into regime four. We never take
23 model uncertainties out of the equation. If we don't,
24 if it's not --

25 CHAIR STETKAR: I'll give you, I'll give

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1 you that. Indeed, it does say you need to look at
2 model uncertainties throughout. But this notion of
3 parametric uncertainty, though, is a slippery slope
4 because what is a model uncertainty and what is a
5 parametric uncertainty? Suppose I'm using a fire
6 model to evaluate a flame height, and within that fire
7 model, whether it's an algebraic empirical correlation
8 or, you know, a zonal model or, in principle, a CFD
9 model, there are a number of parameters that are input
10 to that model, all of which have uncertainties. But
11 I don't quantify those uncertainties in that model.
12 I simply put in a nominal value, and I crank out a
13 result. Is that parameter uncertainty? Is it model
14 -- you know, my result from that model doesn't have
15 uncertainty on it.

16 MR. PARRY: No, I would argue that, in
17 those circumstances, if you were using different
18 approximations to calculating that value, that turns
19 out to be more of a model uncertainty than a parameter
20 uncertainty. And I --

21 CHAIR STETKAR: So, for example, the use
22 of the EPRI5 empirical correlation versus a different
23 correlation that might be in whatever the NRC
24 empirical correlation, certainly that is a --

25 MR. PARRY: That's a model --

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1 CHAIR STETKAR: -- a source of model, too.

2 MR. PARRY: Yes, yes. And --

3 CHAIR STETKAR: MELCOR versus MAP, for
4 example.

5 MR. PARRY: Right.

6 CHAIR STETKAR: Which you don't address.

7 MR. PARRY: Okay. We'll skip over that
8 one.

9 CHAIR STETKAR: But I'm just trying to
10 understand, honestly, I'm trying to understand this
11 subtle difference between where do we transition from
12 model uncertainty to parameter uncertainty because
13 I've got a wonderful example that I'm going to bring
14 up once I try to understand your --

15 MR. PARRY: Okay. I think, I think what
16 you're saying is correct. You have to be very careful
17 about the way this is defined. And the parameter you
18 think we're talking about are really the probability
19 distribution to put on basic events.

20 CHAIR STETKAR: Yes, okay. And that's
21 important because. Here's my example. I think it's
22 NUREG -- John, help me out -- 1934, the fire? Thank
23 you. NUREG-1934, fire modeling. We had a meeting on
24 it. They, indeed, address model uncertainty and they
25 also address parameter uncertainty within the context

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1 of a model.

2 MR. PARRY: Right.

3 CHAIR STETKAR: There's a wonderful
4 example in there where, if you put mean values through
5 an algebraic equation, you conclude that a flame
6 height does not impinge upon your cables of interest.
7 If you actually quantify the uncertainty distributions
8 on the heat release rates through that same
9 correlation, you conclude that there's something --
10 don't hold me to the exact percentages -- there's a
11 30-percent probability, because of the large
12 uncertainties, that, indeed, the flame height does hit
13 the cable, which has a tremendous impact on then how
14 you model that whole process.

15 MR. PARRY: Yes.

16 CHAIR STETKAR: I'm not sure where that
17 fits into regimes one, two, and three in this context,
18 but without -- now, you can say, well, that's
19 parameter uncertainty, but it's not in the context of
20 what you just told me because it's not a basic event
21 that you're quantifying state of knowledge correlation
22 through. It's not a model uncertainty in the sense of
23 looking at correlation A versus correlation B. It's
24 looking at the uncertainty and the results from that
25 model and how it would affect your conclusion.

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1 MR. PARRY: Yes.

2 CHAIR STETKAR: And I didn't see any of
3 that coming through in this guidance.

4 MR. PARRY: That's probably true. But I
5 think where we would have to deal with that, and this
6 is something that we'll take into account, would be in
7 the appendices because I think that's where we would
8 need to be clear about sources of model uncertainty --

9 CHAIR STETKAR: Because part of that,
10 actually, is changing the, it could change the format
11 of the logic model and, you know --

12 MR. PARRY: It surely could, yes. Yes,
13 yes.

14 CHAIR STETKAR: -- I mean, you know, how
15 you implement that point three or whatever is
16 mechanics in a sense. But identifying the fact, the
17 only way you do it is actually propagating those
18 uncertainties through it.

19 MR. PARRY: Yes, and those are --

20 CHAIR STETKAR: You know, I don't want to
21 get hung up on the semantics of is it that model or is
22 it parameter because it's a parameter propagated
23 through a model.

24 MR. PARRY: Yes, yes.

25 MS. PRESLEY: But is that something you

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1 would perform a sensitivity study on?

2 CHAIR STETKAR: I don't believe in
3 sensitivity studies, so we'll talk about that later.
4 I believe -- no. And the reason for this is I don't
5 know what a sensitivity study on that mean value
6 means, and I don't know how people use it. Suppose I
7 come up with -- I don't remember what the mean value
8 was. Let's call it two with no units on it. Now, if
9 I did an uncertainty analysis, which I did, I found
10 out that the uncertainty about that parameter gave me
11 a 30-percent probability that, indeed, a flame height
12 would impinge on a cable. If I do a sensitivity study
13 on that value of two, what do I do? Do I increase it
14 plus or minus a factor of two? Well, if I increase it
15 by a factor of two, maybe by doing that it does hit
16 the cable, but maybe it doesn't if the uncertainty is
17 really broad. So do I increase it a factor of ten or
18 a hundred? And then I say, well, gee, that's
19 unrealistic because I had a mean value and what does
20 it mean to increase a mean by a factor of a hundred?

21 So that's why I don't like this notion of
22 uncertainty distributions or sensitivity studies on
23 the mean because it's the mean of an uncertainty
24 distribution. You already have the information. I
25 had that information because I calculated a mean. I

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1 calculated the mean from the uncertainties. I knew
2 the likelihood that, indeed, it would exceed a certain
3 threshold.

4 MR. PARRY: I think I would craft
5 sensitivity studies differently then because I think
6 if, in the one case, you could, by using the mean
7 you've demonstrated that there's no impact. And if
8 you did the uncertainty propagation and you found
9 there was an impact --

10 CHAIR STETKAR: Yes, which is this
11 example.

12 MR. PARRY: -- which is this example, in
13 that case, I would say, well, okay, it does -- if that
14 makes a difference to your application, then you
15 better rethink whether you're doing the right thing
16 when you do the full propagation. And I think that
17 would tend to lead you to do the more detailed
18 analysis for the actual application. If it could
19 affect it, I think you would do the more detailed
20 case, and you wouldn't -- because one is a shortcut of
21 the other, right? Substituting the mean values is a
22 shortcut to doing the --

23 CHAIR STETKAR: Right.

24 MR. PARRY: -- full propagation --

25 CHAIR STETKAR: Well, but I mean this

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1 notion of if I substitute the mean values and I win,
2 the notion is, to address some of the concerns, you
3 say, well, do a sensitivity study on the mean.

4 MR. PARRY: I wouldn't say that, though.
5 That's not what -- I think your situation is a little
6 different, that you wouldn't necessarily do the
7 sensitivity study on the mean. I think you would --

8 CHAIR STETKAR: If you had the full
9 uncertainty distribution, there's no reason to do the
10 uncertainty on the mean. You may be saying the same
11 thing.

12 MR. PARRY: Well, that's where we may be
13 saying the same thing, yes.

14 CHAIR STETKAR: Because you, I mean, it
15 doesn't make sense.

16 MR. PARRY: Yes. But even that, you could
17 say, I mean you'd have to have some notion that the
18 mean that you were getting by substituting mean
19 values, I think you'd have to have some idea of
20 whether that was going to be realistic or not if you
21 were going to use it. And maybe the only way to do it
22 is to do the full propagation. I think, I mean,
23 you're bringing up a good point, but I don't know that
24 we can, we can't address all these situations. That's
25 the problem. But I think --

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1 CHAIR STETKAR: Well, granted --

2 MR. PARRY: -- is a good one.

3 CHAIR STETKAR: No. Granted, you can't
4 address all the situations. Again, I'll step back to
5 the person, the practitioner who's going to be picking
6 up these documents and saying what do I need to do
7 tick off my box that I can satisfy the regulator that,
8 when they, you know, when a reviewer has to tick off
9 their box, did they adequately address uncertainties,
10 the answer will be yes, verily, they followed this
11 guidance and did it. And some of the messages, you
12 know, that you convey either through examples --
13 examples are good, but examples that are focused, you
14 know, only on one experience set sometimes narrow
15 people down a little bit to where they shouldn't.
16 This one from the fire, I mean, it's kind of a
17 classic.

18 MR. PARRY: Yes, yes.

19 MEMBER BLEY: But you see the same thing
20 in other places.

21 CHAIR STETKAR: Oh, yes, you do. I mean
22 --

23 MEMBER BLEY: At least to me, you know,
24 when you sit around this table with the people who are
25 here, I think you kind of know what these things are.

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1 But if you're picking up this book, these two books to
2 tell you how to do it and the books kind of say
3 parameter uncertainty is not important --

4 MEMBER SHACK: Well, but in John's
5 example, what worries me more is the fact that the
6 uncertainty is something that you add to an existing
7 PRA. It seemed to me if I had the PRA and I'm dealing
8 with the uncertainty, John's thing sort of has to be
9 built into the PRA as he's developing the model. I'm
10 not sure how, you know, here we are with a given PRA
11 and we're somehow trying to divine the uncertainty,
12 whereas in his model the guy that's done the mean
13 value has already set up the model, he hasn't included
14 it, and he's set up his success criteria and
15 everything and he's often, now, somehow, he's missed
16 things.

17 CHAIR STETKAR: Well, he's missed things,
18 but, I mean, part of this guidance says that, for
19 particular applications, you may have to go back and
20 change the structure of your model, you know. And
21 this is a piece of information, without doing that,
22 you wouldn't know that you'd need to change it.

23 MEMBER SHACK: Maybe that's when you go
24 back and you look at the model for that application
25 that you find that out.

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1 MR. PARRY: I think one of the things
2 that's coming through, to me anyway, is that we need
3 to have a statement in there about the distinction
4 between parameter and model uncertainty because I
5 think, I mean, I can see where you're -- in fire, in
6 particular, and maybe in other places, too, some of
7 the probabilities that we put in the logic models are
8 derived from models that are not simple. I mean, all
9 the stuff, like failure rates and things like that,
10 those are statistical things that you get from it, and
11 that's really, in a sense, what we were talking about
12 here.

13 CHAIR STETKAR: And that's why I was
14 trying to, you know, through provoking, is trying to
15 understand because there are a couple of different
16 notions of model uncertainty. One is comparing MAP
17 versus MELCOR or, you know, CFAST versus MAGIC or
18 whatever. The other is the results of a modeling
19 process, the uncertainty in those results because of
20 treatment of input parameters, you know, or
21 correlations, whatever. And that's sort of missing.
22 That's between the two notions.

23 MR. PARRY: I think that's a good thing
24 that we probably ought to add something in there to
25 clarify that, and I think that would --

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1 CHAIR STETKAR: And a simple example. I
2 mean, I'd go look in that NUREG. It's --

3 MR. PARRY: Okay. What's the NUREG again?

4 CHAIR STETKAR: 1934.

5 MS. DROUIN: I would like to offer that I
6 do think some of this is in a 1055 where we have a
7 chapter where we go into quite some detail, you know,
8 describing parameter uncertainties and model
9 uncertainties. So I would really suggest that we
10 revisit some of this stuff that is there, you know.
11 The problem is is that, as you move along in the
12 process, you know, you will have explained something
13 earlier in a chapter or two chapters earlier and then
14 you forget about some of these things that were
15 already there.

16 CHAIR STETKAR: Well, and that's another
17 reason, Mary, is that, again, as a practical user, the
18 person out there developing the fault trees and event
19 trees and stuff, if the guidance or the public
20 interactions or, you know, if there are workshops or
21 whatever, focuses primarily on the EPRI document as
22 how to do it. At that final point, the process needs
23 to be very, very sensitive to how the user will
24 interpret both the words and the examples and make
25 sure that they capture the broader stuff from the top

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1 because the typical user isn't going to go back and
2 read every page in 1855.

3 MS. DROUIN: But I would like to think,
4 because of the way the NUREG is structured and the way
5 the EPRI document is structured, I personally don't
6 see how that can really happen. If I was a licensee
7 and I saw a NUREG that has a chapter written by the
8 NRC that says here's the strategy you should be using
9 and here's how the NRC is going to review what you've
10 put in, I think I would pay close attention to that.

11 CHAIR STETKAR: Well, let me say --

12 MS. DROUIN: And I would view that --

13 CHAIR STETKAR: -- let me just tell you --

14 MS. DROUIN: -- along with reading the
15 EPRI document, which has given me some examples.

16 CHAIR STETKAR: Well, but some examples
17 carry a message. What those examples are carries a
18 distinct message.

19 MR. PARRY: Yes, we need to look at, re-
20 look at the NUREG-1855 and make the appropriate
21 references. But it's a point well taken because I
22 think it could be misunderstood, and I think people do
23 tend to think they understand stuff without actually
24 understanding the subtleties of what's going on very
25 often.

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1 MEMBER SHACK: Well, I think the whole
2 notion of a consensus model kind of leads to that kind
3 of attitude that, if I'm using a consensus model --

4 CHAIR STETKAR: I'm using a consensus
5 model. A consensus model -- we've had V&V on all five
6 of those fire models, whatever they are. There's
7 reports saying yea, verily, within the constraints of,
8 you know, use these models, they're good. But that
9 V&V didn't talk anything about uncertainty analysis.
10 In fact, the NUREG that talked about the models didn't
11 talk about anything on uncertainty analysis, you know,
12 until they were pressed, for example. So that
13 everybody who knows now that it's the right model and
14 you go to this place and you look up the parameter
15 values and you take a mean value and means are good,
16 you don't use medians, you know, it's excessively
17 conservative to use the 98th percentile and all of
18 that kind of stuff.

19 MEMBER BLEY: I just went back and peeked.
20 I didn't peek at the whole document, I couldn't, but
21 where parameter uncertainty and model uncertainty are
22 defined. And John's example is a nice one, and
23 there's a distinction that I'm not sure is made
24 between parameter uncertainties on things like valve
25 failure rates where we have extensive data and they're

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1 actually reasonably narrow to parameters of physics
2 models where it's really, you could argue whether that
3 parameter uncertainty you described is parameter or if
4 it's hiding some aspects of modeling --

5 MR. PARRY: Right.

6 MEMBER BLEY: -- or it's just, it's quite
7 broad because it's a physics parameter under
8 conditions that aren't narrowly enough defined that
9 you have to cover a wider range. And I'm not sure
10 that jumps out. There's great discussions, but it's
11 a neat example because of that.

12 MR. PARRY: It's a good example.

13 CHAIR STETKAR: I mean, when you think
14 about convolution of full-sized hazard crews with the
15 real uncertainty on the fragilities rather than some
16 surrogate mean curve or something like that is another
17 -- I mean, you know how to do it mechanically but
18 people don't do it.

19 MEMBER BLEY: In a physics parameter, you
20 get that kind of thing.

21 CHAIR STETKAR: Yes, any kind of natural
22 or physics. You're right.

23 MEMBER BLEY: Or chemical. A natural
24 parameter.

25 CHAIR STETKAR: Yes.

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MS. DROUIN: But I would really put it to the committee, and I'm not trying to discount what you're saying, I'm truly not. I'm coming from a purview of practicality, trying to get something out the door with not a lot of resources and we're running out of time. Is this a fatal flaw to this document? You know, we can continually improve, improve, improve, and I certainly, you know, understand that. But is this something that makes this document difficult and has a high potential for misuse? I would say, no, it doesn't. Now, that's my personal opinion, you know. I recognize these things, but I've got to come back and look at this from a practical perspective.

MEMBER BLEY: We'll have to think about that a little bit. Actually, over all possible applications, is there a high chance of misuse? Probably not. Over cases where you're focusing on the kind of problem that was described here, yes, maybe it is. We'd have to think about that some more.

MR. PARRY: I certainly think we can add something into this document to clarify what we mean when we make these statements.

MEMBER BLEY: And if you had examples of

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1 this kind of thing over in the EPRI document, I think
2 that would go a long way.

3 CHAIR STETKAR: It doesn't take, it
4 doesn't take many examples. It takes, like, one that
5 you say, hey, think about this kind of thing.

6 MEMBER BLEY: And a story with it that
7 generalizes that one example.

8 MR. PARRY: We might, as Mary pointed out,
9 we may have some examples in the Appendices B through
10 E, not A.

11 CHAIR STETKAR: Well, those are just
12 tables, though. And that's --

13 MR. PARRY: Well, I know, but there is
14 issues and they describe what --

15 CHAIR STETKAR: Yes, that's right. I
16 mean, you're right.

17 MR. PARRY: So we'll check to see what --

18 CHAIR STETKAR: Check to see.

19 MEMBER REMPE: Maybe elaborate kind of the
20 descriptions of the tables. I'm thinking of, like,
21 the one --

22 CHAIR STETKAR: Well, but, I mean, the
23 whole purpose of those tables, though, isn't to try to
24 get too specific.

25 MEMBER REMPE: Yes, but if they spurred it

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1 a little bit more with a little more detail, maybe it
2 would cover it.

3 CHAIR STETKAR: Okay. We've probably
4 spent -- I think you hear it.

5 MR. PARRY: Yes, yes. No, no, it's good.

6 CHAIR STETKAR: Back to this thing,
7 though. I mean, honestly, you may want to think about
8 some of this because I did get the impression that one
9 should pay, you know -- you even have the
10 approximately two times little multiplier on this
11 thing here, that as long as my mean value is about a
12 factor of two below my acceptance criteria I don't
13 really need to pay much attention to uncertainty
14 analysis.

15 MR. PARRY: That's not what it says.

16 CHAIR STETKAR: You may want to read that
17 --

18 MR. PARRY: That's not what it says.

19 CHAIR STETKAR: Okay.

20 MR. PARRY: What it says is that's really
21 related to parameter uncertainty and whether you need
22 to do the full propagation of the state of knowledge
23 correlation. That's the only thing that relates to
24 that.

25 CHAIR STETKAR: Okay.

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1 MR. PARRY: And even that factor of two is
2 sort of fuzzy because, in some cases, it's pretty
3 obvious that you have to do it because you've got a
4 lot of problems. You know, a lot of your cut sets
5 have these correlated things. So it's not intended as
6 that at all. It's purely for the propagation of --

7 CHAIR STETKAR: You know, let me give you
8 an example.

9 MS. PRESLEY: Is there a specific thing
10 that gave you that impression?

11 CHAIR STETKAR: Yes. Step, you know, on
12 page 27, step five, final comparison with acceptance
13 guidelines. There's a statement that says, "The rigor
14 with which the uncertainty analysis is performed is a
15 function of the closeness to the acceptance
16 guidelines. For example, if the analysis of model
17 uncertainty does not result in a challenge to the
18 acceptance guidelines, a rigorous acceptance of the
19 parameter uncertainty may not be needed." I don't
20 know what that last sentence means, but the first
21 sentence seems to give me --

22 MR. PARRY: No, that's purely referring to
23 the propagation of uncertainty. It's only the
24 parameter, that's only the statement knowledge
25 correlation stuff. That's the only thing that's

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1 intended to reflect.

2 MS. DROUIN: The reason this figure was
3 created is we sat down with NRR and NRO with quite a
4 bit of time for them to explain to us the actual ways
5 they do the review, how they attack it, how they
6 approach it.

7 CHAIR STETKAR: I understand that, but,
8 quite honestly, they don't know and they don't care
9 about uncertainty. That's one of the problems we have
10 in this agency, and it's got to stop, Mary. You know,
11 I realize that they want a simple-minded way out.

12 MS. DROUIN: Yes, they do.

13 CHAIR STETKAR: And we can say that. So
14 I understand the feedback you're getting from NRR and
15 NRO. I understand that.

16 MS. DROUIN: And I don't think that they
17 discount uncertainties. I think what we're trying to
18 do is find a practical way to deal with them and to
19 try and illustrate that it is going to be, you know,
20 commiserate with where are they in terms of the
21 acceptance guidelines. And that's a philosophy that
22 this agency has had, you know, since we started
23 bringing risk insights into play that, you know, the
24 closer you are to your acceptance guidelines the more
25 justification you're going to need. And so this is,

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1 all this is trying to communicate is that, you know,
2 when you're in regime one and you have taken into
3 account your uncertainties and you're in regime one,
4 you're not going to need to provide as much
5 justification. But as you approach, you know, regime
6 three, we're going to take a very close look, we want
7 to have a very good understand about your
8 uncertainties.

9 CHAIR STETKAR: But, I mean, we're living,
10 we need to stop thinking about error factors of, like,
11 three for pump failure rates and X to the fourth, you
12 know, for pumps for state of knowledge correlation
13 because we're entering a time in risk assessment and
14 use of risk-informed applications that are addressing,
15 and we'll eventually get to your work on large
16 uncertainties --

17 MS. DROUIN: Well, I don't know where that
18 2X came from.

19 CHAIR STETKAR: -- we're dealing with a
20 lot of things like fires, flooding, seismic events,
21 those types of things that, by definition, have large
22 uncertainties associated with them. And when you say,
23 well, I'm in regime one because I've accounted for my
24 uncertainty, if I've accounted for my uncertainty in
25 the mean sense and I'm in regime one, but my

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1 uncertainty is so large that there's still a 10-
2 percent chance that I might exceed my acceptance
3 guideline, that might be okay for a decision-maker to
4 have that information. The decision might be that's
5 fine, but the decision-maker ought to have that
6 information that there's a 10-percent probability that
7 I might exceed the acceptance guideline, despite the
8 fact that I've got large margin on the mean. And
9 that's the kind of thing that I'm talking about, the
10 message that this sends, that's being derived from
11 level one and internal events only core damage
12 frequency world of PRA to something that's going to be
13 applied going forward, you know, maybe over the next
14 decade or so, and be pointed to as guidance for how to
15 think about things that way. Now, I always use the
16 financial stuff. If my financial advisor had told me
17 in 2006 that there was a five-percent probability that
18 I would lose 40 percent of my net worth, I might have
19 made different --

20 MS. DROUIN: Absolutely.

21 CHAIR STETKAR: -- investment decisions,
22 even though their best estimate was that I would gain
23 money, right?

24 MR. PARRY: I think there's two things
25 that I'd like to point out here. First of all, that

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1 statement in 2.7, on page 2.7, I think we can link
2 forward to section 4.2 because I think it's explained
3 better there, and that's the intent of it. But the
4 other point that I see you straying towards is really
5 looking at whether we should be even changing the
6 acceptance guidelines because you're now worried about
7 how much --

8 CHAIR STETKAR: No, no, I don't want to
9 muddy that. No, no, no.

10 MR. PARRY: Okay. Well, it sounded like,
11 to me, that you were because really, in a sense, even
12 if we have a tail that crosses the acceptance
13 guidelines, that's not the way --

14 CHAIR STETKAR: We're talking about risk-
15 informed decisions here, and, indeed, you know, both
16 the NUREG and the EPRI document do a very good job
17 about the notion that that's not just based on a
18 number out of the PRA. It's based on five principles,
19 and it's integrated. And in that sense, I'm not
20 talking about changing the acceptance guidelines. I'm
21 talking about developing risk information for that
22 decision that appropriately represents both an
23 expected value, mean value if you want to call it
24 that, and information about if the uncertainty is
25 broad and it might give you some probability that you

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1 do not meet the acceptance guideline, that
2 information, so the decision-maker can look at that
3 and say, well, I still feel confident we have the
4 ability to make a reasonable assessment that, for a
5 variety of reasons, the decision is okay, despite the
6 fact there's a small probability that it might be
7 exceeded. And that's the whole notion of this, you
8 know, the gray area there anyway. So, no, I'm not --

9 MS. PRESLEY: I think that's exactly why
10 we have chapter five, and maybe some of these
11 discussions will be more --

12 CHAIR STETKAR: Chapter five is --

13 MS. PRESLEY: -- directed because that's
14 really, you're in those areas when you have large
15 uncertainties and when you're dealing with things
16 important to defense-in-depth. So in terms of coming
17 up with an application and a story that holistically
18 represents your real risk profile and what you're
19 worried about, I think that's what we strive to
20 explain in chapter five. So maybe some of this
21 discussion will come up again when we --

22 CHAIR STETKAR: Yes, let's --

23 MS. PRESLEY: -- go forward, if that's
24 okay.

25 MR. PARRY: Yes, that's fine. But I do

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1 think, though, that, you know, we've thought about
2 this back in the day when we were developing Reg Guide
3 1.174 is what should the metrics be and should we have
4 a guideline that said that you've got to be less than
5 this with X percent confidence. That is really,
6 really difficult when we're dealing with very small
7 numbers.

8 CHAIR STETKAR: Sure.

9 MR. PARRY: So it was decided back then
10 that we shouldn't, that we wouldn't do that. So I'm
11 not sure what you do with that information or what
12 anybody would do with that information.

13 CHAIR STETKAR: I'm not sure what you do
14 with that information. Now, I'm not trying to make
15 that -- I think that's beyond what we're talking
16 about.

17 MR. PARRY: Okay.

18 CHAIR STETKAR: I would like people to
19 have the information, though, so that they can think
20 about it.

21 MR. PARRY: Okay.

22 MS. PRESLEY: And I think that's within
23 the guidance, though, chapter five.

24 MR. PARRY: Yes, we do have the
25 percentiles and stuff on that.

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1 MS. PRESLEY: Well, and also the quality,
2 I mean, the qualitative stuff that you do for large
3 uncertainties.

4 CHAIR STETKAR: Chapter five, we'll get to
5 chapter five. Chapter five, by and large, I think is
6 actually really good. It's just the other parts that,
7 again, if I'm picking up this document as a user, PRA
8 group leader out at a utility instructing, you know,
9 the people who work for me or myself, what message is
10 this telling me?

11 MS. PRESLEY: We'll take another look at
12 it for the tenor of, I mean I think we have a good
13 idea of what the issues are, and make sure that we're
14 conveying what we actually intend to convey.

15 MR. PARRY: Right. Could I ask for a
16 short break?

17 CHAIR STETKAR: You can. We were going to
18 break later, but you can do that. Let's take a --
19 until 2:25 we're recessed.

20 (Whereupon, the foregoing matter went off
21 the record at 2:07 p.m. and went back on
22 the record at 2:22 p.m.)

23 CHAIR STETKAR: We're back in session.

24 MR. PARRY: Okay. So we were, we showed
25 the diagram of the regimes and sort of talked a little

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1 bit about how we were going to use that. Okay. So
2 we're on this slide now, which is slide 14. And,
3 actually, this just repeats what I said earlier is
4 that, basically, when the results are far from the
5 acceptance guidelines, parameter uncertainty, in the
6 sense that we talked about it, like valves and pumps
7 and all that sort of stuff, is generally unimportant,
8 except in some cases where it's obvious that it is
9 important. So maybe that's an obvious statement, but
10 this is just based on the experience that we have with
11 doing PRAs for various applications. So in that case,
12 just the substitution of mean values in the cut set
13 equation is probably adequate to get the mean.

14 But we also think that, if you're getting
15 close -- and the reason we set this factor of two is
16 that the way the NUREG was written it said things like
17 from below an order of magnitude to slightly below or
18 slightly above the acceptance guideline as defining
19 regime two, so we wanted to put some more specificity
20 on slightly. And we figured that a factor of two was
21 a good place to start, even though it's not a
22 definitive criterion. But, certainly, if you are
23 within a factor of two, it would be wise to do the
24 full propagation, if you could.

25 CHAIR STETKAR: Again, I'd caution you,

1 when I read this, I read it with a very cynical view,
2 obviously. And I look for things where people will
3 point to something and say I don't need to do it
4 because I am 2.5, and they said it's only important if
5 I'm within 2 or 3. Now, again, I'd just caution you
6 to read it with that -- you can't read it, because you
7 wrote it, with that degree of cynicism, but someone
8 can somehow. The problem is a lot of the public
9 comments you get might not do that either.

10 MR. PARRY: Right.

11 MS. PRESLEY: If we link it back to where
12 we got the guidance from, because a lot of that is
13 from 1016737, of how much, where you're looking and
14 where it's important and how much of an impact it's
15 made in those cases, I think if we link it more
16 closely to that, maybe porting that section back into
17 this document --

18 CHAIR STETKAR: Some of those examples in
19 the appendix on 1016737 are good examples.

20 MS. PRESLEY: Yes. But I agree. We'll go
21 back and look at it and make sure we're not --

22 MR. PARRY: You know, and I agree, you
23 know, anything you write can be misused,
24 misinterpreted because nobody reads the small print,
25 typically --

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1 CHAIR STETKAR: Well, they read the small
2 print, but they read it if it's in their best
3 interest.

4 MR. PARRY: Yes, yes, okay. That's a good
5 point. I think we just need to make sure that that
6 isn't used inappropriately as much as we can. But the
7 next point that's important is that, since the model
8 uncertainties may be large, and these are usually the
9 big things, so they've got to be assessed for all
10 regimes, basically. And what we've done is to
11 provide, we've done in this document, in chapter four,
12 is to reproduce the guidance that we had in the old
13 EPRI document, which is what you were saying that
14 maybe we shouldn't have done --

15 CHAIR STETKAR: Let's say there was
16 substantial overlap there.

17 MR. PARRY: Yes. So we haven't changed
18 the process any, but it's the way in which we refer to
19 the different appendices that is a little different.
20 And I don't know if you want me to walk through the
21 next three slides because you've seen these before in
22 the previous version. There's not a lot new here, and
23 there's not a lot that's not, in fact, totally
24 consistent with what's in NUREG-1855. It just talks
25 about, you know -- well, let me not deal with it. Let

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1 me go on to the next one.

2 In this case, what we're really saying is
3 that we've identified the owner of the PRA should have
4 identified the sources of model uncertainty because he
5 has to do that to meet the standard in the base PRA
6 model. There are other things that you have to do,
7 though. The things that are important are those that
8 affect the risk metrics. So it's the uncertainties
9 that can affect the contributors to the risk metrics
10 that are really what we're trying to focus on here.
11 And they can come from two places. They can come from
12 the base PRA model, but they can also come from the
13 way that the cause/effect relationship is developed,
14 from the way that you model the impact. So you've got
15 to consider all these sources of uncertainty, and it's
16 on that set that can affect the risk metrics that we
17 then formulate sensitivity studies to see if they're
18 going to be significant. And the whole of the
19 formulation of the sensitivity studies and the logical
20 combinations, etcetera, is no different from what was
21 in the previous document and what's also in NUREG-
22 1855.

23 And the next figure is, essentially, just
24 sorting out, using the sensitivity studies to sort out
25 which are the key sources of uncertainty. So we're

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1 really looking for those that can impact the decision
2 and, in particular, those that can change the decision
3 because those are the ones that we need to focus on.

4 CHAIR STETKAR: Now, let me ask kind of a
5 question here. Does this whole process presume that
6 I have numbers for which I have no measure of
7 uncertainty? I don't want to call them parameters
8 because of -- I mean, in other words, why do I do
9 sensitivity studies? Because I have no notion of what
10 the real uncertainties are?

11 MR. PARRY: No, no. Well, one thing you
12 can do sensitivity studies on, if you have a different
13 model to evaluate a specific parameter --

14 CHAIR STETKAR: That's true.

15 MR. PARRY: -- you can do a sensitivity
16 study on that. Now, there are other things you can
17 do, though. For example, human error probabilities
18 that we know we have no certainty on those --

19 CHAIR STETKAR: But we have quantified
20 uncertainties.

21 MR. PARRY: Yes, but do we really believe
22 that those quantified uncertainties are significant in
23 any way?

24 CHAIR STETKAR: You know, I'd argue that
25 if you don't believe that you're not doing what you

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1 ought to do.

2 MR. PARRY: Well, I'm not --

3 CHAIR STETKAR: If you quantified your
4 uncertainties, you ought to live or die by them. They
5 mean as much as that seventh significant figure mean
6 value.

7 MR. PARRY: But in many cases, understand
8 that I think that a lot of the methods, the
9 uncertainties are just, they're mandated, right? If
10 the number is X, then the error factor is three. If
11 the number is 2X, maybe the error factor is five.
12 There's no real assessment of the uncertainty, if
13 you'd like. It's almost paying lip service to it.
14 But what I'm saying is that there are things you can
15 do with HEP that one thing you could say is, well,
16 okay, let's see if I calculated all the HEPs with
17 model X I'll get one set of values and I'd get their
18 uncertainties. If I did them with model Y, I'd get a
19 different set. We realize this is, we meaning I think
20 a lot of people involved in the development of the
21 guidance documents, for example the guidance documents
22 for 5069, we realized back then it's pretty
23 impractical to get people to do two sets of HRA models
24 to make any sense.

25 So what you can do is you play with the

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1 values as a set to see whether by increasing the human
2 error probabilities you're going to get different
3 insights than you would with a base and, similarly, if
4 you lower them you might get different insights. And
5 I think it's done, it's a slightly different sort of
6 way of using the sensitivity analysis. You're not
7 using it to say this is the result. You're using it
8 to generate --

9 CHAIR STETKAR: You wouldn't do that with
10 pump failure rates, though or valve failure rates.

11 MR. PARRY: No, probably wouldn't do that
12 with pump failure rates and valve failure rates
13 because I think we feel we have enough information on
14 those statistically to characterize the uncertainty,
15 and that's already addressed by using the mean values.

16 MS. PRESLEY: I think the key word on that
17 slide is the related assumptions. I mean, those are
18 really, the assumption, I mean . . .

19 MR. PARRY: Yes. Of course, the example
20 I gave is a little bit different because, in that
21 case, we're not really looking to calculate numbers,
22 per se. We're looking to characterize whether
23 something is risk significant or not. And the way
24 it's done for 5069 is you take the inclusive set,
25 rather than the one particular value of the HEPs. All

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1 right. We'll move on.

2 So in step six then, that's the part of
3 the integrated decision making. That's really where
4 everything comes together, and you're presenting the
5 results to the decision maker. So the topics that we
6 address in chapter five are comparison of the results
7 to the guidelines, a characterization of the results
8 to the decision-maker, and this includes, I think --
9 you can look there, John. I think it actually
10 includes the 50th and 95th percentile of the risk
11 metrics, as well as the mean value. So it's included
12 in there.

13 CHAIR STETKAR: It says parametric
14 uncertainty.

15 MR. PARRY: I'm sure it does, yes. It
16 does because I think the model uncertainties are going
17 to be characterized largely through the presentation
18 of the sensitivity cases for the various sources of
19 model uncertainty, and the reason we're doing it that
20 way is you can find out which of these sources of
21 uncertainty are going to help, are going to challenge
22 the guidelines. And given that, then you have to
23 justify whether the particular model uncertainty or
24 the particular sensitivity study that challenges the
25 guidelines, you have to first position it in some way,

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1 either by saying, well, okay, this is not really
2 credible but we put it in there to see how bad it
3 could get. That's one way, okay? Another way is to
4 say, well, okay, I'm not sure about this, but I think
5 if I put something in place, like a compensatory
6 measure, I can combat that source of uncertainty. I
7 can change the way I implement the proposed change to
8 effectively negate that source of uncertainty. Oh,
9 and the other thing is that, depending on what that
10 source of uncertainty is, I might be able to do
11 performance monitoring to make sure that the changes
12 that actually occur don't exceed a pre-defined level
13 that, well, that don't exceed a pre-defined level.
14 And that really hasn't changed. I mean, that's always
15 been the case, I think, with all this stuff.

16 So the other things we address in that
17 chapter are, first of all, integration of the PRA
18 results with the other percentiles of risk-informed
19 regulation, and particularly defense-in-depth. We put
20 something in on defense-in-depth, and we put in a
21 section on dealing with large uncertainties, as well.

22 CHAIR STETKAR: Are you going to talk more
23 about those three things?

24 MR. PARRY: I'm not going to talk much
25 about the comparison of the results of the guidelines

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1 because I think that's been covered pretty much
2 elsewhere. I will talk more about the, specifically
3 about defense-in-depth and a little bit about large
4 uncertainties.

5 So in this slide, it's just a recap of
6 what the five principles are and, clearly, where
7 uncertainty really rears its ugly head, if you'd like,
8 where it's dealt with is in two. It's also dealt with
9 in three, although we don't say very much about that.
10 Safety margins are clearly a way of dealing with
11 uncertainty, but we don't really deal with that one in
12 this document. We'll talk more about defense-in-
13 depth. Really, the principle thought is what we've
14 been talking about anyway, and then the other one on
15 the performance monitoring. I'm not going to talk
16 about that now, but that's also addressed in there.
17 And you know the classic example, again, of that is
18 5069 where you're lessening the special treatments.
19 You don't really know how to model the impact on
20 equipment reliability, but if you set a limit such
21 that, if you set a limit on the increase of equipment
22 unreliability that is consistent with principle four,
23 proposed changes being small, if you do your
24 performance measurement to demonstrate that you can
25 maintain it within that value, then that's an approach

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1 to dealing with that source of uncertainty.

2 Okay. Next one. So the proposed approach
3 that we've included in this report for addressing
4 defense-in-depth, I have to note that this is not
5 something that NRC has adopted or endorsed but we
6 think it's a fairly pragmatic approach. And I should
7 say that, although it's not written on this slide, I
8 think one of the assumptions going in here is that,
9 given that the plant has been designed and operated in
10 accordance with the regulations, it is assumed that
11 the defense-in-depth is, in fact, achieved to the
12 extent that we know about it. And Fukushima maybe
13 throws a little bit of a monkeywrench into that in
14 some ways, but that's, you know, that's something we
15 can't do very much about. We're going to change the
16 state of the plant as it is. So to the extent that
17 defense-in-depth is adequate according to our state of
18 knowledge at this moment, we can assume that it's
19 there.

20 So what we did was to develop a guidance
21 recognizing that defense-in-depth is essentially
22 hierarchical, by which I mean is that I think most of
23 the documents that you look at will accept, will agree
24 that defense-in-depth is established by having a set
25 of barriers, whether they're physical barriers or

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1 administrative barriers. But there are things that
2 you need to have in place that prevent bad things from
3 happening. And the way that the plant achieves that
4 is by implementing certain strategies, like having
5 redundant or diverse systems, having training, all
6 these things that help to ensure that the barriers
7 are, in fact, effective.

8 So the focus of the approach that we've
9 presented in here is to make sure that, when the
10 license amendment request comes in, it doesn't affect
11 the presumed balance of levels of protection through
12 physical changes to the plant or changes to the way it
13 operates. And the -- if we can move on to the next
14 one, I think.

15 So what we've done is to say that what
16 they should do is identify and assess changes that may
17 adversely affect achieving a required safety function,
18 particularly when the level of redundancy or diversity
19 is limited or where significant uncertainty exists.
20 Identify and assess the impact of defense-in-depth
21 crosscutting changes, and these could be things like
22 administrative changes, maintenance changes, that will
23 affect multiple safety functions or cut across levels
24 of protection. And then we'll also use things that
25 can't be addressed directly by the PRA, such as late

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1 containment failures. We don't really have a good
2 metric for that in the current regulatory framework.

3 CHAIR STETKAR: You mean in the current
4 level of PRAs that people have developed?

5 MR. PARRY: No, I mean in the current set
6 of metrics, like CDF and LERF, which are the ones that
7 we use for Reg Guide 1.174.

8 CHAIR STETKAR: Okay.

9 MR. PARRY: If we had acceptance
10 guidelines placed on large release or other things,
11 then, yes, we would have some way of looking at it.
12 Okay. I should actually say that if you look at SRP
13 19.2, which used to be SRP Chapter 19 a long time
14 back, a lot of these thoughts are actually in there.
15 I think the thing that wasn't explicit in there was
16 that the assumption that the plant does start out with
17 an adequate level of defense-in-depth. And I think
18 that, in a sense, is what makes this process logical.
19 If you can't start with that position, I think you're
20 on a bit more shaky ground.

21 But what we concluded is that if you meet
22 the acceptance guidelines of principle four, you've
23 demonstrated to some extent, at least at an integral
24 level, defense-in-depth is maintained for those issues
25 that relate to CDF and LERF. You haven't changed them

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1 very much. Therefore, you cannot change the defense-
2 in-depth very much. But that's really just an overall
3 look.

4 The thing that we're proposing is that
5 what you should do, though, is understand where the
6 changes are being made. And the example here is a, I
7 think it's quite a good one in the sense that it shows
8 how this can affect things differently.

9 So let's look at a couple of cut sets.
10 They're both low frequency, but one of them may also
11 be low order. If you look at, think about propose to
12 change the surveillance frequency on, say, the reactor
13 pressure vessel on the LPCS system for boiler, the
14 pressure vessel appears in a single element cut set.
15 The LPCS appears in cut sets of very high order
16 typically because we have so many systems in a boiler
17 to put injection in. And, also, if you look at the
18 impact of the frequency of surveillance on the RPV
19 failure probability and that on the LPCS system, you
20 probably have a lot more uncertainty.

21 So while you could argue from the point of
22 view, perhaps, of a probabilistic argument that you
23 could justify a change for the reactor pressure vessel
24 surveillance frequency, you'd have to make a much
25 stronger case than you would for LPCS because for LPCS

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1 it probably doesn't matter. You can probably take
2 LPCS out of the model and you wouldn't change the CDF
3 very much at all.

4 CHAIR STETKAR: Risk achievement would be
5 pretty small.

6 MR. PARRY: Yes, yes. So this is just an
7 example, I think, of how you need to understand the
8 role of the thing that you're doing and relate it to
9 the level of redundancy, the role it plays in
10 preventing, in performing that function.

11 CHAIR STETKAR: Now, before you -- I'll
12 ask Mary. You had that nice qualifier on the bottom
13 of page 20. It says this approach has not been
14 endorsed by NRC. Is that in the report?

15 MS. PRESLEY: It will be. That was one of
16 the comments, our comments.

17 CHAIR STETKAR: I was going -- since
18 there's a lot of discussion these days about defense-
19 in-depth, one of the questions that I wrote to myself
20 was, you know, does the staff agree with this,
21 regardless of my own personal opinion.

22 MS. PRESLEY: That was one of the
23 comments, and we're going to add --

24 MR. PARRY: We're going to add a caveat.

25 CHAIR STETKAR: Okay.

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1 MR. PARRY: Okay.

2 MS. DROUIN: We don't endorse it, but it's
3 not meant to say that there's not good thoughts or
4 anything. It's just a recognition, as you well know,
5 that we have ongoing work on defense-in-depth with,
6 you know, going forward with the development of the
7 policy statement. So that's all going to be worked
8 out in the end, and we're not going to get ahead on
9 this EPRI document and start endorsing things in a
10 very narrow scope.

11 MR. PARRY: Yes. Because I think what
12 you're dealing with is a much bigger issue than this
13 particular case, which is to do with license amendment
14 requests.

15 MS. DROUIN: I mean, and it will all
16 trickle down because, you know, we're in the midst of
17 revising Reg Guide 1.174, and that's been put on hold
18 to after the larger effort so that, you know, it's all
19 done in a consistent coherent manner.

20 MEMBER BLEY: What a concept.

21 MS. DROUIN: I know. What a concept.

22 MR. PARRY: What is it? Consistency is
23 the hobgoblin of small minds. Is that what someone
24 said?

25 MEMBER SHACK: Foolish consistency.

1 MR. PARRY: Oh, okay, thank you. Okay.
2 We've also got a discussion here on addressing large
3 uncertainties. This is really triggered by some of
4 the more recent events.

5 CHAIR STETKAR: Gareth, first, before we
6 go into this, how large does my uncertainty have to be
7 before it's large?

8 MR. PARRY: You know, I was pondering that
9 question when I was re-reading this section in
10 preparation for this meeting.

11 CHAIR STETKAR: No, I mean, seriously,
12 because it's sort of this section --

13 MR. PARRY: I know.

14 CHAIR STETKAR: -- you know, we're going
15 to talk about this section but --

16 MR. PARRY: Okay. I --

17 MEMBER BLEY: Your example comes to mind.

18 CHAIR STETKAR: Yes. And, indeed, that
19 uncertainty really wasn't all that large, like it
20 wasn't an error factor of a hundred. You know, it's
21 not the kind of uncertainties that you see in seismic
22 hazard that are quantified. It was a fairly modest
23 uncertainty and, yet, without considering it, you
24 would make the wrong decision, for example. So I
25 think it is important to say you have this now section

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1 on ways to think about and address large
2 uncertainties.

3 MR. PARRY: Yes. I actually think,
4 though, what we've done is we've commingled a couple
5 of things in here because you could argue that a large
6 uncertainty is one that changes the decision perhaps.
7 Okay. It's large enough to worry about.

8 CHAIR STETKAR: Okay. But that certainly
9 doesn't come through here.

10 MR. PARRY: No, no, no, it doesn't. It
11 doesn't. And that wasn't the original intent of the
12 section.

13 MEMBER BLEY: You've hit on something kind
14 of interesting, though. Your example turned out
15 important. If you look at seismic, if you run median
16 values, you get the same kind of confusion. But if
17 you run mean values, usually you're okay. The
18 uncertainty there is so big, the mean is driven way up
19 in the high end of the distribution, which kind of
20 makes it okay. So if the uncertainty is large enough,
21 mean values kind of cover --

22 CHAIR STETKAR: The 96th percentile
23 anyway.

24 MR. PARRY: But I think what this was
25 triggered by was really things like external flooding

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1 where we really do not have good models for
2 calculating the frequency of the events. And,
3 therefore, you can have very, very large differences
4 between the frequencies, particularly if you're trying
5 to do any extrapolation from the historical data,
6 which may or may not be relevant. But it also means
7 that you don't necessarily have a nice little
8 distribution because what Dennis said is true. If
9 you've assumed a lot of normal distribution or one of
10 those skewed distributions, then, yes, the mean gets
11 driven way up as the uncertainty goes up, and it will
12 be ahead of the 99th percentile in some cases.

13 CHAIR STETKAR: Eventually, yes.

14 MR. PARRY: But in this case, maybe you
15 don't even have a distribution, you just have
16 assessments that are over a very large range. And
17 what it really means is that you really don't know
18 what the frequency is. It's not useful to do the
19 standard Reg Guide 1.174 calculation because you don't
20 know whether you've got the mean.

21 CHAIR STETKAR: There is some, and this is
22 philosophy, and I don't, you know, we have to be
23 careful about philosophy, but, see, my philosophy is
24 you do know. As a risk assessor, it is incumbent upon
25 you to examine all of the available information and

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1 express your current state of knowledge with your
2 uncertainty. That is the best we can do. That is
3 what we understand. We understand that there's a five
4 percent probability that I'll lose 40 percent of my
5 net worth. That's really broad uncertainty, but
6 that's the best we can do today. And we assess our
7 risk and our margins to safety based on our current
8 state of knowledge, and if our state of knowledge
9 ignores the fact that we might have a 14 meter tsunami
10 hit my nuclear power plant sometime in my measurable
11 lifetime, you know, we've not done our job right. If
12 we'd evaluated our uncertainty for that and said, yes,
13 there's a measurable uncertainty that this could
14 happen, I still might make a decision that's wrong,
15 but at least you've done that.

16 So this notion that I can't evaluate the
17 frequency of large flooding because I can't evaluate
18 the uncertainty, I don't subscribe to that. Yes, you
19 can. It might be very broad, but if it's the best you
20 can do, if you've done a good job doing that, the best
21 you can do, that's what it is.

22 MS. PRESLEY: The question is is it, I
23 mean, how meaningful is it to do that if there are
24 other things that you can do to get you a better
25 understanding of the situation? And that's where --

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1 CHAIR STETKAR: What's a better
2 understanding, though? Give me an example of what's
3 a better understanding than that.

4 MS. PRESLEY: I think this idea of trying
5 to figure out if there are cliff edges. That's a good
6 -- I mean, the risk insights of what the large
7 uncertainty, where do you actually have to start
8 worrying about it, and then back-calculating, well,
9 what would my frequencies have to be and then what
10 realm does that put me in? Does that -- okay. The
11 frequencies have to be slow that that puts me in the
12 realm of worrying about whether climate change or not
13 is driving my models, and maybe that's where I can be
14 a little bit more comfortable in saying that. But if
15 that cliff edge is driven by a different type of model
16 uncertainty, maybe the river shifts because there's a
17 seismic event or something, and that's more graspable.
18 Then maybe that changes our decision. I mean, the
19 numerics aren't important. It's the drivers behind
20 those numerics and trying to get at those when the
21 uncertainties are so long and everything is mashed
22 into a really broad distribution. You have to have
23 some tools to parse that out.

24 MR. PARRY: I tend to agree with Mary. At
25 some point, the numbers do sort of become, I wouldn't

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1 say necessarily irrelevant but they're certainly not
2 anything you can hang your hat on. Therefore, you
3 should be looking to other approaches to dealing with
4 this, and part of that is to understand what the
5 impact of these uncertainties is and is there anything
6 you might be able to do about it, or do you have to
7 live with it?

8 But this would get into more -- this,
9 though, is also in, it's in the context of making
10 risk-informed changes to the plant, so the plant
11 exists, as opposed to changing the design of the plant
12 to accommodate these large uncertainties. And that's
13 a definite thing, and I think we have to be a little
14 clearer about that in the document.

15 CHAIR STETKAR: It might help.

16 MR. PARRY: Yes, because I think, you
17 know, we have to say, okay, there is a very large
18 uncertainty. We really don't know what's happening
19 with the external. But does, it might be --

20 CHAIR STETKAR: Let's say I wanted to
21 install FLEX stuff at my plant and want to know how
22 high a pedestal I need to put it on so it doesn't get
23 washed away in the flood that I'm trying to protect it
24 against.

25 MR. PARRY: That's a design problem.

1 That's a design problem.

2 CHAIR STETKAR: Well, should I need to
3 know how high that flood might be and how often --

4 MR. PARRY: I think it would be helpful.

5 CHAIR STETKAR: Okay.

6 MR. PARRY: But I --

7 CHAIR STETKAR: That's a change to my
8 plant. I mean, it's a relevant thing we're talking
9 about.

10 MR. PARRY: Okay. It's a change to your
11 plant, but it's not -- yes. But that's a design
12 change. That wasn't what we were, it wasn't -- it's
13 not going to be -- okay, all right. Hold on, hold on.
14 I've got the answer. I've got the answer. That's a
15 change the plant was designed to make the plant safe
16 for sure, right? What we're talking about is changes
17 to other things in the plant and would they be
18 affected by this particular hazard event.

19 CHAIR STETKAR: One of the things, you
20 know, we can toss examples back and forth a lot,
21 something you said going in is that you might need to
22 better define the boundaries about what -- you said
23 this is in the context of a risk-informed change in
24 the license.

25 MR. PARRY: Right.

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1 CHAIR STETKAR: But my sense is it might
2 be a little bit more narrowly defined even than that.

3 MR. PARRY: It's possible. Yes, I think
4 any change that you're going to make that can be
5 demonstrated to make the plant safer should be
6 acceptable without going through much --

7 CHAIR STETKAR: But, I mean, some of these
8 same principles could, as long as you're going to make
9 a change to make the plant safer, small changes that
10 have a large potential benefit, you ought to be aware
11 of that.

12 MR. PARRY: Yes.

13 CHAIR STETKAR: I mean, the fact, you
14 know, you put two meters of nominal grade versus three
15 meters above nominal grade, it might not be all that
16 much expense if you're making a change, given the fact
17 that even two meters will help you. Just something to
18 think about. It doesn't answer how big does it have
19 to be before it's big enough.

20 MR. PARRY: No, it doesn't. It doesn't.

21 MS. PRESLEY: But to address that, this
22 process is, and one of the public comments that we got
23 was that this process is fundamentally no different
24 than how you would assess any other model uncertainty
25 with one exception where you may not go that far in

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1 the cliff-added effects, but, fundamentally, this is
2 the same --

3 CHAIR STETKAR: Well, but even the cliff
4 edge effects, I'll come back to the 5 percent losing
5 40 percent of my net worth. I didn't lose it all.

6 MR. PARRY: You sound somewhat bitter
7 about that.

8 CHAIR STETKAR: That's why I'm somewhat
9 bitter. But even that, you know, it's uncertainty
10 about the degree of the hazard, the frequency and the
11 consequences. Go on. You know, we're going to run
12 over time here if we're not careful.

13 MR. PARRY: So, basically -- yes, we'll go
14 on to the next one. Yes. Basically, we just outlined
15 a process for doing this.

16 CHAIR STETKAR: Actually, back up to the
17 last one because there were a couple of things. I
18 mean, one is the philosophy of this whole thing, but,
19 apparently, flooding can't be addressed but seismic is
20 no problem because we know how to do that and have
21 been doing it, despite the fact that the uncertainty
22 is not real big.

23 MR. PARRY: No, no, no, that's not, that's
24 also not taken out of the equation because there are
25 things in modeling that's seismic, and we give the

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1 example of the correlation effect, for example, that
2 can have an impact, and that can be big because,
3 basically, you're saying you fail one and you fail
4 them all. That can make a big difference to the
5 frequencies.

6 CHAIR STETKAR: But in terms of the
7 seismic hazard, you feel pretty comfortable that we've
8 expressed our uncertainties in that okay, despite the
9 fact that they're really large. You have other
10 examples about --

11 MR. PARRY: Yes.

12 CHAIR STETKAR: -- doing sensitivities on
13 the mean of the seismic hazard, which you'll
14 eventually get to.

15 MR. PARRY: I think the thing with the
16 seismic hazard is we know the uncertainties are large,
17 but we also have, to some degree, a consensus approach
18 to calculating those. So it's a frequency, but
19 there's a consensus approach to representing the
20 uncertainty.

21 CHAIR STETKAR: So if we had that
22 consensus approach for flooding, we'd be okay with
23 flooding.

24 MR. PARRY: We'd be in better shape.

25 CHAIR STETKAR: Okay.

1 MR. PARRY: Right.

2 CHAIR STETKAR: Okay.

3 MR. PARRY: Okay. So the process is
4 really, it's not very different from what you would
5 do. You would understand if this source of
6 uncertainty, what is its role in the decision making,
7 how does it affect things, and then we have some ideas
8 on how you address that and how you might integrate it
9 with the other principles but particularly defense-in-
10 depth. Performance monitoring for some things really
11 is not going to help you too much. You can't monitor
12 the impact of a large flood, for example. If it
13 happens, it happens.

14 So the types of things that we do is, in
15 recognizing that the large uncertainties, one of the
16 things they can do is they can potentially
17 overestimate computed risk. In some cases, that
18 overestimation is known to exist. In some cases, it's
19 not known whether it's an overestimation or not. It
20 depends on the type of uncertainty we're talking
21 about.

22 One of the things that's critical is that,
23 if you put conservative assumptions into a model, and
24 one of the examples is this complete correlation of
25 seismic failures, you can mask the effect of the

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1 change on the risk because you could take a diesel out
2 for maintenance. If you assume that when the
3 earthquake hits that all the diesels fail, then it has
4 no impact on the risk by taking that out. It's a
5 rather extreme example, but it's a case of where
6 making a conservative assumption can mask the change
7 in risk. But you can see whether that's significant
8 by relaxing that particular assumption in that case,
9 so maybe you don't put the correlation in and you put
10 it in as random and see whether that changes things.
11 So that's one way of looking at it.

12 CHAIR STETKAR: Some of that, though,
13 there is guidance in NUREG, and I can't recall --

14 MR. PARRY: Yes, I think there probably
15 is.

16 CHAIR STETKAR: -- about subdividing
17 contributors by hazard groups. So, for example, if
18 you looked at, you wouldn't see a change in your
19 example for the seismic hazard group, but you might
20 see a measurable change for the internal events hazard
21 group. That's a different set of -- and when you
22 combine the two, if your risk was dominated by
23 seismic, that's a third piece of information. But the
24 decision-maker would have that comparative
25 information.

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1 MR. PARRY: Yes. And we --

2 CHAIR STETKAR: You're saying prompt the
3 computer about the whole listed pie.

4 MR. PARRY: Well, not necessarily because
5 this would be a portion of that pie that could mask
6 everything by --

7 CHAIR STETKAR: Sure, sure.

8 MR. PARRY: So I don't think it's any
9 different. I think you always have to understand
10 where this -- that would come into understanding the
11 role in the decision making and the potential to
12 affect the decision. So I think, yes, no, a part of
13 what we describe in this report is, in fact, that you
14 do have to decompose the results and understand where
15 they come from. Potentially underestimating the
16 computed risk, while I'm not quite sure what -- to be
17 honest, I can't remember what we were thinking about
18 here. But if you've got large uncertainties, the
19 certainty is the possibility that you can
20 underestimate risk. But it escapes my mind now what
21 we precisely had in mind with that.

22 But as far as the cliff edge goes, one of
23 the ways you can look at it, at least in the decision
24 making context, is say, you know, reverse engineering,
25 if you'd like, figure out what likelihood for this

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1 cliff edge would you have to have to make it
2 significant to the decision and then work on that
3 basis.

4 CHAIR STETKAR: Okay. Let's think about
5 that because Mary brought it up. Let's think about
6 the floods and say, okay, I need to have a 14-meter
7 flood to come over my cliff edge effect. How do you
8 address that? What is the likelihood that you would
9 get that and how you divine a likelihood that gives
10 you confidence that you can make a decision that it's
11 not a problem?

12 MR. PARRY: I think what you'd have to do
13 is you'd say, okay, I'm going to say I've got my
14 decision, this is an element in the decision, how high
15 does that frequency, and let's say the consequences of
16 this cliff edge is that you have core damage. CCDP is
17 one. What you would be looking at to see is at what
18 frequency is that assumption likely to change my
19 decision, if it can?

20 CHAIR STETKAR: Okay.

21 MR. PARRY: That gives you a piece of
22 information. What you do with that information, it's
23 like any of the other assumptions that we're going to
24 deal with because none of these assumptions can be
25 proved. So you have to come up with an argument of

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1 why you think that frequency is low enough that you
2 can live with it. And that may be a specialist
3 argument. I mean, we can't give the guidance on how
4 you do that, but that gives you a path for at least
5 trying to address that situation. But it's like any
6 other assumption. If we have two assumptions, and one
7 of them kills the decision and the other one doesn't,
8 you still have to make, if you want to go with the
9 decision, you still have to explain why that
10 assumption that kills it is not believable.

11 CHAIR STETKAR: Have some confidence that
12 the frequency is low enough that --

13 MR. PARRY: Not the frequencies because
14 this isn't the frequency. This is is this assumption
15 correct or is that assumption correct. You have to
16 have confidence that that assumption is not a credible
17 assumption.

18 CHAIR STETKAR: I think I lost you. Walk
19 me through the example of the cliff edge effect on the
20 flood because I lost something about an assumption.
21 There is a flood high enough that's going to flood the
22 whole thing.

23 MR. PARRY: There is, and you know what it
24 is.

25 CHAIR STETKAR: And you know what it is

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1 because you know what elevation --

2 MR. PARRY: Because you've calculated the
3 elevations. What this is saying is, okay, I want to
4 do -- what I need to know is what is the likelihood
5 that that cliff edge occurs that could change my
6 decision? If that likelihood was a 10 to the minus 2,
7 I'd say I've got a problem.

8 CHAIR STETKAR: Well, when you say
9 likelihood, I think frequency, so maybe we're not
10 communicating.

11 MR. PARRY: It's the frequency of the
12 flood that --

13 CHAIR STETKAR: That is big enough.

14 MR. PARRY: -- is big enough to give you
15 the cliff edge, right.

16 CHAIR STETKAR: Okay. So we're talking
17 about the same notion --

18 MR. PARRY: Yes, we are.

19 CHAIR STETKAR: Okay.

20 MR. PARRY: Okay. So all the reverse
21 engineering does is it tells you what that frequency
22 has to be to change the decision. Now what you have
23 to do is you have to look at all the evidence to
24 decide whether that frequency is believable.

25 CHAIR STETKAR: So you have to assess your

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1 confidence in --

2 MR. PARRY: You have to do some
3 assessment, yes. And I think it's a little different
4 from producing a hazard effect because now you can
5 start piling on extreme things to come up with it to
6 see whether you can get that frequency.

7 CHAIR STETKAR: So I don't see a
8 difference in the two processes --

9 MEMBER BLEY: That's where I'm kind of
10 sitting here and --

11 CHAIR STETKAR: There's some subtlety here
12 that I think I'm missing but . . .

13 MR. PARRY: Well, I think that's because
14 you guys come from the Caplan school of putting
15 probabilities on everything, right?

16 CHAIR STETKAR: Well, because there
17 probably is probabilities on everything. Sometimes
18 they're really small, and sometimes the range is
19 fairly large.

20 MR. PARRY: I'm being a little facetious,
21 but I think there is a difference with trying to make
22 a case that a likelihood that you've come up with is
23 bounding or not likely to be achieved than there is to
24 try and do an analysis that gives you a whole range of
25 frequencies because you can look it from a more

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1 bounding approach this way. And if you can show that
2 you think that likelihood, that frequency is, the way
3 you'd have to get to that --

4 CHAIR STETKAR: I mean, I see what you're
5 saying, honestly, Gareth. But I'll take your 10 to
6 the minus 2 number. If I say there's a half of one
7 percent probability, 0.005 probability that, indeed,
8 the frequency would be 10 to the minus 2, is that good
9 enough? I mean, is that sufficiently incredible, or
10 does it have to be a one billionth of one percent
11 probability that it could be that high?

12 MR. PARRY: Well, I don't see how --

13 CHAIR STETKAR: For a decision-maker.
14 Now, this is a decision-maker because a decision-maker
15 is going to make a decision, you know. And depending
16 on how risk adverse that decision-maker is, a half of
17 one percent might be good enough or a one billionth of
18 one percent might not be good enough, depending on the
19 particular decision-maker.

20 MR. PARRY: No, I don't think we can do
21 that. I also don't think that I, I mean, this is what
22 I meant by saying you were following the Caplan school
23 of thought that you can actually put a probability on
24 that. I'm not sure you can because I don't know how
25 you would do it, to be honest. So I'm not even

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1 suggesting you can come up with these numbers, like I
2 am, you know, 0.02 percent confidence that this is
3 bounding. To me, that doesn't mean --

4 CHAIR STETKAR: Well, but if I'm a
5 decision-maker and you say, well, look, the frequency,
6 to make a difference, the frequency has to be
7 whatever, 10 to the minus 2, once in a hundred years.
8 If it's less than that, it isn't going to make any
9 difference.

10 MR. PARRY: Right.

11 CHAIR STETKAR: If it's more than that,
12 I've got a real problem. How do you convince me that,
13 indeed, I am so confident that I'm not even close to
14 that 10 to the minus 2 that I don't need to worry
15 about it? How do you develop that convincing
16 argument? Do you just say, well, obviously, these
17 things are incredible?

18 MS. PRESLEY: So if you have a --

19 CHAIR STETKAR: You know, it's much less
20 than the frequency of a meteorite hitting the plant
21 that, that --

22 MEMBER BLEY: The decision-maker is going
23 to say how sure are you of that.

24 CHAIR STETKAR: How sure are you of that.

25 MR. PARRY: I agree. And I think maybe

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1 the things you have to do to look at all the things
2 that could happen, that would have to happen to
3 generate that and come up with some frequency, but I'm
4 guessing here because I'm not an expert in hydrology,
5 right? So I can't tell you how to do that. All I'm
6 saying is that this is one way of looking at it, and
7 then somebody would have to come up with the argument
8 that this frequency is believed to be negligent. And
9 I think it's not that we're saying it's, I wouldn't
10 want to say it's 0.02 percent because the decision-
11 maker wouldn't know what to do with that anyway.
12 These decision-makers are not, they're not sitting
13 there with a, you know, calculator saying --

14 MEMBER BLEY: But, see, you were real
15 close, you were real close to the non-quantified way
16 is when you can say I've considered this list of all
17 the things that could contribute and I can't think of
18 anything else and I can't find anything in the
19 literature beyond this set, this is a complete set.
20 Then you're pretty far along in the game, whether you
21 do what John wants or not.

22 MS. PRESLEY: Or if you can winnow it down
23 to a couple of things that are so uncertain and so
24 little data is available. I mean --

25 MEMBER BLEY: Then I'm going to want to

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1 hire a wall.

2 MS. PRESLEY: Then you're going to -- yes.
3 But at least that tells you something.

4 MEMBER BLEY: Or bigger pumps inside or
5 something.

6 MR. PARRY: No, we're not claiming that we
7 have all the answers to this. We've --

8 CHAIR STETKAR: I mean, it's help. I
9 understand, you know, sort of the rational that you're
10 using and the approach. I'm not convinced personally
11 that the amount of effort is different, whether you
12 approach it from building to hazard or whether you
13 look at how big does the hazard have to be to give me
14 confidence, but I at least understand.

15 MR. PARRY: And perhaps what we need to do
16 is to maybe have some examples of how this is done and
17 try to --

18 CHAIR STETKAR: You know, examples really
19 help.

20 MR. PARRY: Yes.

21 CHAIR STETKAR: But go on.

22 MR. PARRY: So, really, that's all I think
23 we wanted to say about this particular issue. I mean,
24 if you have specific comments, obviously we'd like to
25 hear them. But just on the next slide --

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1 CHAIR STETKAR: The only comments I had
2 reading through this, and I actually thought that this
3 discussion of large uncertainties, I liked it.

4 MR. PARRY: Okay, good.

5 CHAIR STETKAR: I really did. Some of the
6 specifics I didn't like so much.

7 MR. PARRY: Yes.

8 CHAIR STETKAR: This whole notion of when
9 you say that you can do an uncertainty, a sensitivity
10 study on the mean unreliability value, and there's
11 several statements. And when you talk about
12 sensitivity studies, you talk about them in terms of
13 sensitivity studies on the mean unreliability values
14 for operator reliability, organizational
15 effectiveness. There's several things where you talk
16 about that phrase. As soon as I --

17 MR. PARRY: In chapter five?

18 CHAIR STETKAR: Table 5-1.

19 MR. PARRY: Okay, okay.

20 CHAIR STETKAR: Okay. As soon as you say
21 mean value, I think I already have an uncertainty
22 distribution because I have a mean value. And once I
23 have an uncertainty distribution doing a sensitivity
24 study doesn't make any sense to me because I already
25 have all of the information I need.

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1 MR. PARRY: Okay.

2 CHAIR STETKAR: That's why I asked
3 earlier, if I have a guess, I guessed it was 10 to the
4 minus 3 without doing any real analysis, then, yes,
5 doing a sensitivity study on what happens if it's 10
6 to the minus 2, what happens if it's 10 to the minus
7 1, in some sense, makes some sense.

8 MR. PARRY: Yes, okay.

9 CHAIR STETKAR: Because people will look
10 at that and say, well, okay, I have a mean value, I
11 have a mean frequency of a seismic acceleration of one
12 g. I had that mean value, and if I vary it plus or
13 minus five that's okay. Well, I have the uncertainty
14 distribution. Just use it.

15 MR. PARRY: Your point is taken. I think
16 we need to look at that to make sure that we're not
17 using the terms inappropriately, using the term "mean"
18 inappropriately because I don't think that's what we
19 meant. Yes, you're right. If you have a
20 distribution, why --

21 CHAIR STETKAR: Why not use it?

22 MR. PARRY: -- sensitivity. Yes, I agree.
23 So I think we just need to --

24 CHAIR STETKAR: This notion of where you
25 do -- that's a lot of what I hung up on this because

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1 it might be just misinterpretation of terminology or
2 something. In many cases, I got the notion that
3 you're recommending that we do sensitivity studies on
4 things for which we already have some quantitative
5 estimate of the uncertainty. And as I said, when I
6 read mean value, that's what I think.

7 MR. PARRY: I think in some of the
8 literature related to this in the past, that is, in
9 fact, what's done, like with common cause failures,
10 right? Some of the common cause failure things are
11 all shifted to the 95th percentile just to see if it
12 makes any difference because, actually, if you -- but
13 that's in the case of looking for insights as to
14 what's significant, as opposed --

15 CHAIR STETKAR: Yes. But, I mean, people
16 have criticized that approach also --

17 MR. PARRY: I know they've criticized that
18 approach, but, you know, you need to do something
19 because the impact there is that if you overload the
20 common cause failure stuff, you're going to mask
21 stuff.

22 CHAIR STETKAR: Sure.

23 MR. PARRY: If you under-load it --

24 CHAIR STETKAR: Sure. But, see, the point
25 is if you've done a decent job of evaluating the

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1 available data and assessing your uncertainty about
2 that, saying how bad could it be if your beta factor
3 was one, I mean, it doesn't make any sense. Make it
4 seven.

5 MR. PARRY: That would be interesting.

6 CHAIR STETKAR: Do you follow what I'm
7 saying?

8 MR. PARRY: Oh, yes --

9 CHAIR STETKAR: Some of that notion of
10 just doing sensitivity studies for the notion of kind
11 of playing numbers games is not what we ought to be
12 telling people to do.

13 MR. PARRY: No, except what you're really
14 doing is you're saying, well, okay, what happened, I'm
15 going to look, I know that my common cause failure
16 methodology isn't that great and the data is pretty
17 sparse. What happens if we were way off on CCF either
18 one way or the other? Does it change the way, does it
19 change the way the risk profile looks sufficiently to
20 give me different insights? And it's done for that
21 reason alone. It's not --

22 CHAIR STETKAR: But if we were way off,
23 the data would have told us that. We would have seen
24 either no common cause failures or we'd be seeing them
25 everyday.

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1 MR. PARRY: But you know that the way that
2 the common cause failure database is. There's an
3 awful lot of judgment that goes into calculating those
4 numbers.

5 CHAIR STETKAR: You know, but there's a
6 judgment -- if this valve failed, is it a failure or
7 not?

8 MR. PARRY: Yes, I know, I know, I know.

9 CHAIR STETKAR: So there's uncertainty in
10 everything that we do.

11 MR. PARRY: Right.

12 CHAIR STETKAR: Go on. We're getting
13 short on time.

14 MR. PARRY: Yes. This is just a reminder.
15 This is just a summary of what's in chapter three, and
16 that's just some explanation of how you might
17 decompose results to get an understanding. That's the
18 intent of it. It's a bit of an orphan in this
19 presentation, but I just put it in there. I don't
20 think there's too much controversial about that,
21 hopefully. That's all I wanted to say. Well, I mean,
22 again, it's not changed from what was in chapter seven
23 of the old NUREG-1855.

24 MS. PRESLEY: So then the last piece is,
25 obviously, we have the appendix, the appendices.

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1 Appendix A illustrates how we applied our process. B,
2 C, D, E provide tables. There's an excerpt of the
3 headings for the tables for fire, seismic, low-power
4 shutdown, and Level 2.

5 CHAIR STETKAR: Let me ask you about
6 Appendix A. The NUREG report solved many of our
7 questions back in June about the example by excising
8 the example from the NUREG report. So the NUREG
9 solved all of our issues regarding the example in the
10 NUREG. The example, I did a text compare side by side
11 and, other than references to specific section
12 numbers, it's verbatim from what the example was in
13 the NUREG.

14 MS. PRESLEY: I thought we put in a couple
15 more caveats.

16 MR. PARRY: I thought there were a few
17 more caveats put in --

18 CHAIR STETKAR: Well, not in the text
19 compare I did, and I looked at the June version of the
20 NUREG and I looked at the version of the example in at
21 least the incarnation of your report that we got, the
22 one that went out, I guess, for public comments you
23 said. And I challenge you to find differences.
24 Certainly --

25 MS. PRESLEY: It would have been in

1 footnotes, but they were there.

2 CHAIR STETKAR: I think I even checked the
3 footnotes.

4 MS. PRESLEY: Okay.

5 MS. DROUIN: I can tell you that, and
6 maybe it's in an earlier version, and this was before
7 you were on the committee, when the committee first
8 saw it --

9 MEMBER BLEY: I think John was here when
10 we first saw it. I don't know.

11 MS. DROUIN: I don't think he was.

12 MS. PRESLEY: Well, we definitely
13 discussed the changes. Whether or not those changes
14 made it in the August draft, I'll have to double
15 check.

16 CHAIR STETKAR: All I'm doing -- okay. I
17 don't care when I joined the committee.

18 MS. DROUIN: I just don't know if we're
19 talking about the same changes.

20 CHAIR STETKAR: I compared -- here's what
21 I did. I took the version of NUREG-1855 Rev 1 that we
22 reviewed in June of this year that had the appendix in
23 it. I compared that text side by side with Appendix
24 A in the version of the EPRI report that we received
25 for this meeting. Now --

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1 MS. DROUIN: Okay. You would not have
2 seen changes between those two.

3 CHAIR STETKAR: Boy, oh, boy, I'm glad to
4 hear that because I didn't. So there's a newer
5 version of the EPRI report that we haven't seen?

6 MS. DROUIN: No, no, there's obviously a
7 miscommunication of changes that you wanted to see
8 that we have not done.

9 CHAIR STETKAR: Yes. I mean, that was my
10 -- okay.

11 MS. DROUIN: And I think that's where
12 there's a disconnect because, if we go back a couple
13 of years, the criticism that we had gotten on the
14 appendix is that we didn't have enough caveats and
15 that it could be misused. And I know that we
16 systematically went through and added those caveats.
17 That would have been over the version you saw. So I
18 guess what I'm not understanding is what are the
19 things you were looking for that we haven't done?

20 MR. LAI: You're talking about 209 of the
21 NUREG, Rev 0?

22 MS. DROUIN: I think that's what it was is
23 that we really had not done something that you're
24 looking for because I can tell you the differences
25 between the two, there really, except perhaps in

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1 tweaks that they did in moving it into their document,
2 there weren't full-scale changes made.

3 MS. PRESLEY: No, there were a couple. I
4 do remember there were a couple of comments from John,
5 actually, I think most of them came from John from the
6 last meeting, and they were, I think the flooding, the
7 way we positioned the flooding or the seismic, one of
8 those --

9 CHAIR STETKAR: I have my notes here, and
10 it's because we're running long --

11 MS. PRESLEY: We definitely discussed
12 them. I --

13 CHAIR STETKAR: The concern I had is the
14 notes I had written to myself after the last
15 discussion is that my sense was that, I mean, the
16 notes says, yes, the staff is going to look into this,
17 the implication being that something might be --

18 MS. PRESLEY: Yes, yes, they did change.

19 CHAIR STETKAR: -- changed.

20 MS. PRESLEY: We have the changes. I'm
21 not sure, like, for instance, in Table A-3, the note
22 at the bottom has changed. In the June version that
23 went to you for the last meeting, the note said
24 analysis supporting these conclusions would typically
25 be --

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1 CHAIR STETKAR: That one, that one did --
2 you're right. Yes, that footnote did, indeed, change.
3 That one I stand corrected. I was wrong. That one
4 did change, that one footnote about other -- I've
5 forgotten what it is, but it's the one you cited. I
6 was talking more about details of the examples itself,
7 themselves, that we had some comments on in June --

8 MS. PRESLEY: Yes, I think we ended up
9 adding just a couple more caveats instead of changing
10 the examples because we didn't have the resources at
11 that time. Are there specific ones that really give
12 you heartache that we should really need to go back
13 and look at?

14 CHAIR STETKAR: You know, it's because of
15 time -- I'd go back to our comments from the June
16 meeting. The ones -- what I don't like to do here is,
17 I had raised some questions in June about specific
18 items. I've got 15 pages of things, but it's not fair
19 to raise new ones at this point that I didn't raise in
20 June. I had my shot back in June. In the interest of
21 time, though, it's not clear to me that that's the
22 most effective use of our time today --

23 MS. PRESLEY: Okay. Well, if --

24 CHAIR STETKAR: -- because I still have
25 about a half a dozen things that I raised in June that

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1 weren't changed.

2 MS. PRESLEY: Okay.

3 CHAIR STETKAR: It's not our report.

4 MS. PRESLEY: Well, I mean, we can take a
5 look through the -- I know some of those comments are
6 intermingled with other comments on examples that were
7 in 1855 because that's when those discussions came up.
8 You were talking about examples generally and the use
9 of examples in the document, and you bounced back and
10 forth between stuff that was in Appendix A and stuff
11 that was elsewhere. So we could have very well missed
12 some of those comments. We can take a look back at
13 the notes from the last meeting and try to do a scrub,
14 unless you'd like to send --

15 CHAIR STETKAR: A lot of the comments in
16 the examples, quite honestly, are not, they're items
17 that would benefit, in my mind, from more caveats or
18 better elaboration because I still believe that
19 someone will pick up this document and use it as a
20 template for the bare minimum that needs to be done to
21 check off the box that I've satisfied things. And,
22 therefore, what's in the example is, in many cases,
23 okay within the context of that particular example.
24 What's not in the example might be inferred as
25 something I don't need to do.

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1 MS. PRESLEY: Right. And other than
2 dealing with that in the introduction to the
3 appendices, I mean, when we footnoted that caveat a
4 couple of places, I mean, you can caveat until you're
5 blue in the face. I don't know how much is useful.
6 So if there's, again, some specific parts, I'll go
7 back and look at the notes, if there's some specific
8 things that you think will lead people down a rabbit
9 hole, I think it's important to caveat those. But I'm
10 wary of caveating everything because we do have the
11 general caveat up-front. That's a lot of use of the
12 word caveat.

13 MS. DROUIN: Well, you need to balance it
14 because you don't want to give so many caveats that
15 you discount the whole piece of work there.

16 CHAIR STETKAR: See, part of the thing is
17 one approach is to have very, very detailed examples,
18 which you run the risk of people focusing on that as
19 saying this is necessary and sufficient to achieve.
20 The other is to have perhaps less detailed examples
21 but more that will say, hey, here's an example of
22 something you ought to think about and a real
23 practical example. So rather than going through --
24 what this is is a detailed evaluation of a particular,
25 very-focused change and saying this is the right way

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1 to do it. The other approach is to highlight things,
2 you know, like my fire example of, hey, here's
3 something that has a practical implication. It's not
4 a nuts to soup, beginning to end -- no, nuts to soup
5 is, indeed, beginning to end because you start with
6 things and you grind them up and make a roux and
7 create a soup -- beginning to end template for how to
8 do an analysis. It's rather other examples to say,
9 well, here's an issue and here's one way to address it
10 and here's a different issue and here's an example of
11 another way to address it. So it's broader this way
12 rather than deep this way.

13 MS. PRESLEY: Right. And I think this
14 appendix specifically we were trying to get the deep
15 to show --

16 CHAIR STETKAR: Absolutely.

17 MS. PRESLEY: -- the process.

18 CHAIR STETKAR: That's what it does.

19 MS. PRESLEY: And we'll put the broad
20 where they're needed. I just wanted to point out the
21 caveat, and I think we added or at least tweaked this
22 sentence in the introduction. It should not be
23 construed to imply that this is the only approach or
24 that the specifics of the illustrative example would
25 be sufficient in all cases.

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1 CHAIR STETKAR: No, that's -- and I think
2 that was in the old one, also.

3 MS. PRESLEY: Oh, okay.

4 CHAIR STETKAR: But then, again, somebody
5 is going to read that and --

6 MS. PRESLEY: No, we understand but --

7 CHAIR STETKAR: You can't make it perfect.

8 MR. PARRY: Right.

9 MS. PRESLEY: The other reason it's in the
10 EPRI document and not the NUREG.

11 CHAIR STETKAR: I just, a lot of the
12 detailed examples I brought up in June were meant to
13 sort of illustrate this point. And whether you want
14 to address it by caveats -- I don't know the best way
15 to address it, quite honestly. But it comes back to
16 kind of reading the document with a very cynical
17 skeptical approach to how someone might construe it as
18 being the absolute minimum necessary and sufficient to
19 satisfy the perceived regulatory requirement. I mean,
20 the last thing I think anybody wants to have done is
21 somebody follow, perhaps naively, the guidance in
22 this, come in with an application, and have the staff
23 say, well, this isn't adequate.

24 MEMBER BLEY: Well, that might not be the
25 last thing we'd want to see but . . .

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1 MS. PRESLEY: No, that's a training issue.

2 MEMBER BLEY: One thing we haven't talked
3 about are the Tables B, C, D, and E. And I don't know
4 if you're going to -- you don't have another slide?

5 MS. PRESLEY: No, this is it.

6 MR. PARRY: No, we didn't intend to go
7 through --

8 MEMBER BLEY: There's a lot of stuff in
9 those tables. Now, John's analyst who he's so worried
10 about won't look at those, but, if I'm going to look
11 at those, this sure gives me a lot of hints about
12 things to think about.

13 MS. PRESLEY: John's analyst should look
14 at that. This is the --

15 MR. PARRY: Well, no, that's the intent of
16 having them in there, though, is that they look at
17 them.

18 MEMBER BLEY: Okay. But you can't
19 cookbook these things. These aren't cookbooks.

20 MR. PARRY: No, no, you can't.

21 MEMBER BLEY: This is a pretty broad set
22 of --

23 CHAIR STETKAR: It is.

24 MEMBER BLEY: -- ideas. They're more
25 ideas.

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1 CHAIR STETKAR: It is. And, see, I see
2 those tables useful --

3 MEMBER BLEY: I like that.

4 CHAIR STETKAR: -- more useful than the
5 specific detailed example.

6 MEMBER BLEY: Well, you can't, I mean, are
7 you recommending that we get rid of all the examples?
8 I don't think so.

9 CHAIR STETKAR: No, no, not those tables.

10 MEMBER BLEY: No, no --

11 CHAIR STETKAR: Appendix A.

12 MS. DROUIN: There is two different
13 purposes, and 1855, in numerous places, sends the
14 licensee to those appendices, saying, okay, go to EPRI
15 document, you know, appendix blah, blah, blah, for a
16 generic list of model uncertainties that you need to
17 consider.

18 MEMBER BLEY: Consider. And that's a
19 whole set of information we haven't been talking about
20 all day.

21 CHAIR STETKAR: No, that's absolutely
22 true.

23 MEMBER BLEY: And I guess I'm, I don't
24 know what corner I get backed into listening to my
25 colleague here, but we can't have enough detailed

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1 examples in Appendix A to cover everything. But
2 having some is pretty darn useful to help people deal
3 with it. Maybe one wants a warning on every page
4 don't cookbook this, go see the other tables, you
5 know. There's a lot of issues to be considered, but
6 I think that's a really useful set of information.

7 I haven't quite completely come to grips
8 with how not the person I'd like to see doing these
9 analyses but the person who's coming at it kind of
10 cold, how they learn to use those. That's a bit of a
11 trick. What I haven't thought about before is do our
12 examples in Appendix A send us back to those for
13 ideas?

14 CHAIR STETKAR: No, no, no, that's the
15 problem. That's the problem.

16 MEMBER BLEY: And I think that could be a
17 useful thing.

18 MS. PRESLEY: Yes. So that was one of the
19 public comments that we got, actually, from the user
20 review is you haven't used the tables that you gave us
21 in your appendix. And it was because that example was
22 developed, obviously, way, way before those tables
23 existed.

24 MEMBER BLEY: Maybe John was daisy-
25 chaining toward this all day.

1 MS. PRESLEY: But that's one of the
2 revisions that we're going to make in Appendix A.
3 We're either going to find a way to incorporate them
4 or put in that this was developed before those.
5 Ideally, you would use --

6 MS. DROUIN: That's not an accurate
7 statement.

8 MEMBER BLEY: Which one?

9 MS. DROUIN: That it doesn't use the
10 tables. Remember these are the new tables. There's
11 also the tables in the other EPRI report on internal
12 events, internal flood, and it does refer back to
13 those because, at the time, this example is just meant
14 to illustrate the process. So it does look at how to
15 use these generic sources. It's just for internal
16 events as the example it uses.

17 CHAIR STETKAR: What I wanted to ask is,
18 and that's absolutely true, Mary, but what I wanted to
19 ask is you got comments from the public on EPRI
20 1026511 --

21 MS. PRESLEY: Yes.

22 CHAIR STETKAR: -- that report that has
23 these appendices in it. Now, the RHR example in
24 Appendix A of this report used to live as Appendix A
25 of the NUREG. In EPRI 1016737, there were the

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1 companion tables for internal events and flooding that
2 listed these similar types of things, but it didn't
3 have the example. Did you get any comments -- I mean,
4 you don't -- the example that used to live in the
5 NUREG that is now Appendix A of this report doesn't
6 very well talk to Appendices B, C, D, and E. I don't
7 recall, honestly, whether the example in Appendix A of
8 this report talks very well to what are the companion
9 tables in that other report. Follow me?

10 MR. PARRY: I think it does. I think it
11 does.

12 CHAIR STETKAR: Does it? I don't recall
13 that.

14 MR. PARRY: Well, that's the way it was
15 developed because, in fact, both that table and the
16 example were developed at the same meeting so --

17 MEMBER BLEY: Let me ask you a question.
18 Once all this comes out and it's published, is EPRI
19 planning some courses on use of this?

20 MS. PRESLEY: Not specifically now, unless
21 there's a need for it. We're kind of --

22 MEMBER BLEY: I'm telling you there's a
23 need for it if anybody is going to use it. You have
24 courses on a lot of other things.

25 MS. PRESLEY: We do.

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1 MEMBER BLEY: This isn't the easiest thing
2 to go do if you haven't, if you're not with a group.
3 You know, those of us who have done a lot of this,
4 we've been in a group where there's a bunch of people
5 working on it and you trade ideas and work it out. So
6 if you're the person doing the uncertainty analysis,
7 you don't have that. It's real hard to learn to do
8 this stuff strictly from a report.

9 MS. PRESLEY: We can certainly approach
10 our users and see if they would like the training.

11 MEMBER BLEY: Or maybe your consultants
12 are already planning such a course.

13 MS. PRESLEY: Or maybe it's already -- I
14 don't know. But training is definitely a component of
15 how guidance is used.

16 MEMBER BLEY: NRC will probably have its
17 own course, I assume.

18 MS. DROUIN: On this document?

19 MEMBER BLEY: Or work it into the PRA
20 course or something like that.

21 MS. DROUIN: There are no plans for right
22 now.

23 MS. PRESLEY: Not currently, but we
24 haven't thought that far ahead, frankly. And it's not
25 that we're opposed to it either. So we can bring that

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1 up --

2 MEMBER BLEY: It's worth thinking about.

3 MS. PRESLEY: Yes.

4 MEMBER BLEY: Because it's --

5 MS. PRESLEY: I think, particularly,
6 because I don't think in this go-around we're going to
7 have the time or necessarily the ability to explicitly
8 link Appendix A example to the tables and the
9 uncertainty in those tables. I think what we're going
10 to do is give a more general statement about how it
11 needs to be done and maybe, if we have thoughts on how
12 it could be done, put that in. But if we did do
13 training --

14 MEMBER BLEY: I think that seems
15 reasonable at this point.

16 MS. PRESLEY: Yes. If we did do training,
17 maybe that's something we could look at is actually,
18 well, no kidding, how do you really use these tables?

19 MR. PARRY: I think the other aspect to
20 put in here is that one of the big contributors here
21 would be fire, right? That's the one we'd have to
22 think about.

23 MS. PRESLEY: And that's the one that the
24 public comment was --

25 MR. PARRY: Yes. And that's pretty fluid

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1 right now --

2 CHAIR STETKAR: Well, and some of the
3 comments, some of the comments that we'd had -- I
4 don't think it got into our letter. I don't remember,
5 John. On 1934, the fire modeling, NUREG, was that the
6 staff ought to look at -- I think it was in our letter
7 -- development of case studies to show how all of the
8 uncertainties would be integrated because that was
9 strictly in the model: uncertainties in the initiating
10 event, uncertainties in, you know, other parameters,
11 HRA, things that are in fire models. That's a
12 particular element, you know. It kind of goes toward
13 Appendix B in this EPRI report, but it's along those
14 lines of either developing case studies or courses or
15 something like that.

16 MR. LAI: Yes, the comment is in the
17 letter, the staff saying when they have --

18 CHAIR STETKAR: Right, right.

19 MS. PRESLEY: And there have been some
20 users who have been very vocal on how much they're
21 struggling with this.

22 CHAIR STETKAR: Oh, sure.

23 MS. PRESLEY: So we definitely know
24 there's at least some sort of need out there. Whether
25 it's just those few vocal or more widespread, I'm not

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1 sure. So the last -- are there any other specific
2 comments on the appendices?

3 CHAIR STETKAR: No, I read through
4 dutifully all of the appendices, and I thought the
5 examples were quite good. You can come up -- I don't
6 think it's ACRS's role to come up with details of,
7 gee, this ought to be different --

8 MS. PRESLEY: We did get substantial
9 public comments on Appendix E, so that one is the one
10 that's likely to get some updating.

11 CHAIR STETKAR: Now, Appendix E, my only
12 comment on Appendix E -- I did have a comment on
13 Appendix E. Thank you for the help. And I already
14 actually made it in a snide remark as an aside.
15 Appendix E is, there are examples in there that say,
16 and I'm not going to take the time to go find it right
17 now, but example saying, well, I did this analysis
18 using, for example, MELCOR or MAP. The biggest source
19 of uncertainty might be comparing MELCOR versus MAP,
20 you know. And that whole notion of model uncertainty
21 is absent in Appendix E. It's looking at, primarily,
22 variations in, I mean, it's phenomenologically
23 uncertainty, it's got all of the bells and whistles in
24 there. It looks at variations in parameters within
25 the context of a particular consensus model that

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1 you've selected, but it does not address this notion
2 that if you selected the other consensus model you
3 might get different results.

4 MR. PARRY: And that, actually, might be
5 more relevant because I think the trouble with Level
6 2, as you know, is that it's all epistemic
7 uncertainty.

8 CHAIR STETKAR: Sure.

9 MR. PARRY: So a lot of those things are
10 already in the containment event trees or development
11 of those scenarios. So it's a little tricky one to
12 develop I think.

13 CHAIR STETKAR: It is. That's the only
14 comment I had sort of on Appendix E, generically.

15 MS. PRESLEY: Okay. And the last slide
16 are next steps. As we've mentioned, it's already been
17 sent out for review, and that was sent to the EPRI PRA
18 scope and quality users group, and it was sent to Mary
19 Drouin's group. And like we had mentioned, there were
20 no fundamental issues, just mostly clarification, and
21 you've seen the changes reflected int his
22 presentation.

23 So, initially, we were in sync schedule-
24 wise with 1855. Best laid plans of mice and men. We
25 are still on track for publishing in December 2012,

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1 and that will be before the anticipated release of
2 NUREG-1855 Revision 1. So we are now out of sync.

3 We have in our document a lot of
4 references to sections, but they're fairly high-level
5 section references, and we don't anticipate those
6 section references to change. From our perspective,
7 as long as the draft guidance is published prior to
8 December 2012, and, as Mary had indicated, they are
9 already going through the widgets to get it out,
10 that's sufficient for our purposes. And that also
11 solves, I think, your problem that you need ours
12 published before you can publish yours because you
13 need to reference our full document. So we're okay
14 with that, I think. We're absorbing the risk of
15 public comments completely disrupting 1855, so we
16 don't anticipate that happening. So that's the plan
17 forward.

18 MR. PARRY: Okay.

19 MS. PRESLEY: Okay. Thank you very much.

20 CHAIR STETKAR: Anybody have anymore
21 comments or questions for EPRI?

22 DR. BONACA: One question that was raised
23 but not answered was why two documents? I think that
24 it seems to me there would be a better beneficial
25 effect if they were combined.

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1 CHAIR STETKAR: You know, we can't -- I
2 fully agree. I mean, I don't know whether it's --

3 DR. BONACA: We all agree probably.

4 CHAIR STETKAR: No, that's what I mean,
5 the EPRI document. We can address the other issue,
6 but the EPRI documents, it would hang together so much
7 better, especially because now Appendix A example in
8 the current document is more relevant to the table of
9 sources of model uncertainty in that other one. The
10 whole state of knowledge correlation stuff, I mean,
11 that comes over directly. And you would only have one
12 section, whatever they are, three and four --

13 MS. PRESLEY: Right. I think we can look
14 at that and look at that probably pretty carefully to
15 see how logistically difficult it would be. But the
16 way it evolved, initially, they were two completely
17 separate sets of guidance. And once we ported over
18 chapter four, things got fuzzy.

19 CHAIR STETKAR: But you ported over
20 chapter four and what's now the example in Appendix A.

21 MS. PRESLEY: Yes.

22 CHAIR STETKAR: In terms of what Dennis
23 was talking about, you know, it's relationship to
24 sources of modeling uncertainty. Well, the most
25 relevant ones are over in that other report.

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1 MS. PRESLEY: Yes, yes.

2 CHAIR STETKAR: Regardless of whether you
3 want to put links into some of the other, you know, A,
4 B, C, D, E.

5 MS. DROUIN: Well, you know, it is not an
6 easy thing for NRC EPRI to write a combined report,
7 and I can give you all the nightmares that happen on
8 6850 on the fire.

9 CHAIR STETKAR: At this level, I'm not
10 talking about integrating 1855 and EPRI report. I'm
11 strictly talking about 1026511 and 1016737, making it
12 a single report.

13 MS. DROUIN: We agree with that.

14 MEMBER BLEY: Without disagreeing, almost
15 the same stuff.

16 MS. PRESLEY: So we're going to, we're
17 going to -- it hinges on whether or not we can
18 actually do the clean-up of the references and
19 everything to smush it into one document before we
20 need it published. And we may consider publishing
21 what we have now as an interim, and then smushing them
22 together. But comment well taken. Yes, definitely
23 comment well taken.

24 CHAIR STETKAR: Anything else for EPRI?

25 MS. PRESLEY: I do have a comment towards

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1 why NRC versus EPRI document.

2 CHAIR STETKAR: Okay.

3 MS. PRESLEY: I think there are some
4 benefits of having EPRI document a little bit
5 separately because it gave us the chance to provide
6 some of the guidance that the NRC wouldn't have
7 necessarily felt comfortable putting in and endorsing,
8 like the defense-in-depth stuff.

9 MS. DROUIN: I can tell you I think it
10 was, we've got a better product by not having a
11 combined effort, a much better product.

12 CHAIR STETKAR: I'd like to address some
13 of that when Mary gets in the --

14 MS. PRESLEY: Maybe that was a con for
15 you. Okay.

16 CHAIR STETKAR: We've had some internal
17 discussions about confusion.

18 MEMBER BLEY: If they could disavow hunks
19 of the other one --

20 CHAIR STETKAR: Yes, I mean, that's, I
21 wanted to hear -- I understand how your document hangs
22 together and why. There must be a rationale of why
23 it's not issued as a joint, you know, NUREG.

24 MS. PRESLEY: I can blame it on my
25 predecessor.

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1 CHAIR STETKAR: It sounds like it's
2 probably a staff decision, not an EPRI decision.
3 Maybe not.

4 MS. PRESLEY: I don't know the history
5 well enough. I'm sorry.

6 MS. DROUIN: Are you going to, can we take
7 a break?

8 CHAIR STETKAR: We can, yes. If we want
9 to take a break -- in the interest, I know Bill has to
10 leave fairly close to 5, so can we keep it until 5
11 after 4, 12 minutes?

12 MS. DROUIN: We don't have a full hour
13 presentation.

14 CHAIR STETKAR: You don't think. So we'll
15 recess until 5 after 4.

16 (Whereupon, the foregoing matter went off
17 the record at 3:51 p.m. and went back on
18 the record at 4:02 p.m.)

19 CHAIR STETKAR: Let's get restarted and
20 hear from the staff on 1855. Mary?

21 MS. DROUIN: Okay. At the table with me
22 is Anders Gilbertston from the staff and Jeff LaChance
23 from Sandia. I just want to acknowledge two other
24 major members of the project team is John Lehner from
25 Brookhaven and Tim Wheeler from Sandia. They couldn't

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1 be with us today. So we're going to very quickly just
2 go through the objectives and the background, re-
3 educate ourselves on how the document was restructured
4 from the original version, do a summary of the
5 feedback we got at the last subcommittee, how we
6 changed the NUREG, and then what are our steps
7 forward.

8 Okay. On the, you know, objectives, it
9 had a very narrow focus. This could have been written
10 to deal with uncertainties across all risk-informed
11 decision making. But it was to provide guidance with
12 regard to identifying and characterizing the
13 uncertainties associated with PRA, performing
14 uncertainty analyses to understand the impact of the
15 uncertainties on the results of the PRA. And this one
16 was more in line to support the PRA standard where the
17 PRA standard was requiring you to identify and
18 characterize, and this was giving the means of how to
19 do that. And how do you factor the results of your
20 uncertainty analyses associated with the PRA into your
21 decision making?

22 We started this project, and we found out
23 at the time that EPRI had a similar project going on
24 for some months. So under our MOU, we got together,
25 and it was decided to do a collaboration of our two

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1 projects and to trade information and to, hopefully,
2 you know, issue reports that were complimentary. And
3 it turned out at the time that there was a good
4 division of the labor, so we kept with that. And I
5 think that the documents have served well and worked
6 well together and done in a very efficient manner.

7 CHAIR STETKAR: Now it's probably time to
8 ask you, given that and given kind of the character
9 and nature, I'll use NUREG/CR-6850 as an example of a
10 combined EPRI/NRC report, obviously there was an
11 active decision to keep them separate. It's not
12 entirely clear to me why, given, you know, if I read
13 1855 now, because it liberally cites, as you
14 mentioned, specific sections of the EPRI report, it
15 lists both of those EPRI reports for examples to go
16 look at these reports. Initially, I thought, well,
17 there was, for some reason, that Dennis mentioned that
18 it gives the staff the opportunity to essentially not
19 endorse specific sections of those reports, but I
20 haven't found any places where they're not endorsed.

21 MEMBER BLEY: Or cited.

22 CHAIR STETKAR: Or cited. And the NUREG,
23 I guess, doesn't endorse something but . . .

24 MS. DROUIN: Well, we don't have a blanket
25 endorsement of their document anywhere. We do refer

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1 to specific places in the document where we say go
2 look at this, this has good information in it. And
3 those were -- excuse me. I'm getting over a cold.
4 Those were the, you know, appendices that give the
5 list of sources of model uncertainty. And the staff
6 was heavily involved in the first one in doing a lot
7 of review of it. The second one in this most recent,
8 we were heavily involved because that came out of a
9 joint workshop. And we produced the technical report,
10 all those tables, which EPRI used extensively. So for
11 that part of it, you know, we were involved.

12 But if this had been a combined report, I
13 don't think we would be along where we are today
14 because it would have constituted a much deeper
15 involvement of the staff, you know, because now we
16 would have to read it, you know, agree to the actual
17 language, how something is worded, make sure it
18 doesn't have an implication on a staff position we
19 can't live with. So in this way, you know, we haven't
20 given a regulatory endorsement of the document in that
21 sense.

22 CHAIR STETKAR: What I was going to ask,
23 though, and I need help on this because Reg Guide
24 1.174 does, indeed, refer to NUREG-1855 in several
25 places for guidance on treatment of uncertainties.

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1 MS. DROUIN: Yes.

2 CHAIR STETKAR: NUREG-1855 now refers to
3 an EPRI report for examples let's call them. This
4 notion of, is there a danger that someone will say,
5 well, I followed, I used the EPRI report; therefore,
6 by implications, I met the guidance in Reg Guide
7 1.174? Because 1.174 doesn't say anything about the
8 EPRI report. It doesn't say it endorses the EPRI
9 report, except for, you know, I'll use, since somebody
10 else brought it up, the section on defense-in-depth.
11 It doesn't say that. NUREG-1855 doesn't say this is
12 all good except for the section on defense-in-depth.
13 So there seems to be a danger that nobody disavows
14 anything anywhere. Now, perhaps you look at it and
15 the fact, you know, a very narrow sense that the
16 specific things that are cited in NUREG-1855 are the
17 things that you like. And if you're silent about
18 everything else, by implication, you're silent and,
19 therefore, there's some question. I just can't follow
20 the string.

21 MS. DROUIN: The NRC historically has
22 referenced industry documents. There's a difference
23 between referencing an industry document and endorsing
24 an industry document.

25 CHAIR STETKAR: Right.

1 MS. DROUIN: And we have historically
2 referenced a lot of industry documents that go out, we
3 say go out there, that's good information there. So
4 there's always that danger --

5 CHAIR STETKAR: Okay.

6 MS. DROUIN: -- you know, that's always in
7 there. But there is a difference between, because if
8 we say we endorse it, then that means we have, yes,
9 you follow that, we don't have a problem.

10 CHAIR STETKAR: And you don't see a danger
11 with this just because the way the daisy chain is --

12 MS. DROUIN: No.

13 CHAIR STETKAR: Okay, okay.

14 MS. DROUIN: No. So, you know, as you're
15 aware, the major change we made was a restructuring of
16 the document that gives a much better explicit process
17 on the guidance, and the scope was expanded, which
18 really primarily affected EPRI and not us, to address
19 low-power shutdown, internal fire, seismic, and Level
20 2. We met with the Subcommittee back in June to
21 present the version. You all gave us some feedback,
22 and we have systematically, hopefully, addressed your
23 concerns, which we're going to go through.

24 CHAIR STETKAR: Mary, when you turn your
25 page, be careful on the microphone. When you hit it,

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1 it explodes in her ears, and it's --

2 MS. DROUIN: Sorry about that. This is
3 just a diagram that just shows how the document was
4 restructured and how it's now organized. And it
5 starts off at a high level with stage A telling you
6 whether or not the risk-informed application has to
7 follow this guidance. And we did take into account
8 and we had said it a couple of places that's generic,
9 and we elaborated more in this next version on that.
10 And then stage B through stage F is the guidance for
11 the licensee to follow in how to address the
12 uncertainties as he's pulling together his
13 application. And then the right-hand side is the
14 stage G, and that's the NRC risk-informed review
15 process. And then supporting both of these is the
16 risk-informed decision-making process and the ASME and
17 ANC PRA standard because the standard does require you
18 to deal with uncertainties, and this document is
19 answering those requirements of providing the how-to
20 because, if you remember, the standard is a what to
21 do.

22 MEMBER BLEY: Just enlighten me a bit on
23 how we get from a NUREG to guidance. So we use a reg
24 guide then to point to the NUREG to essentially say
25 this is good guidance to follow.

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1 MS. DROUIN: A NUREG can be a guidance
2 document.

3 MEMBER BLEY: And it doesn't need a reg
4 guide to point to it?

5 MS. DROUIN: No, we have NUREGs that are
6 guidance documents themselves that could -- usually,
7 the NUREG or the reg guide will point back to
8 something.

9 MEMBER BLEY: Yes.

10 MS. DROUIN: You know, so we do have reg
11 guides that do reference 1855 in other documents.

12 MEMBER BLEY: That's what I was thinking.
13 You had to have that to make the link, but you don't
14 need that. You just say that guidance is okay --

15 MS. DROUIN: Right.

16 MEMBER BLEY: -- if it's in the NUREG?

17 MS. DROUIN: Yes.

18 MEMBER BLEY: Okay.

19 MS. DROUIN: So on this sheet, we tried to
20 summarize the feedback that we thought we received
21 from the ACRS Subcommittee. We had taken some notes,
22 and we sent them to get feedback, and we really
23 appreciated your feedback on it. So we've tried to
24 summarize it here into one graph. One was to go
25 through and re-evaluate the use of subjective terms,

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1 and I'll come back to these, each of them
2 individually, and my two colleagues will jump in and
3 save me when I don't say it correctly.

4 Address issues regarding the sources of
5 the model uncertainty, particularly the definition of
6 consensus model; clarify the relationship of
7 uncertainty in PRA and deterministic analyses with
8 defense-in-depth and safety margin. And this gets
9 into the risk-informed decision, the integrated risk-
10 informed decision making process.

11 Consider inclusion of a more generic
12 global process for the application of the NUREG;
13 expand the discussion on bounding conservative and
14 realistic analyses; re-evaluate the discussion on the
15 process of truncation, particularly with regard to its
16 importance on the state of knowledge correlation; and
17 then revisit the discussion of a reasonable
18 alternative for a sensitivity analysis. So, in my
19 mind, these were the seven big ticket items that you
20 all had asked us to go look at.

21 So we actually did do a, I'm not saying
22 that we didn't miss something but --

23 CHAIR STETKAR: I don't think you missed
24 this one.

25 MS. DROUIN: I'm sorry?

1 CHAIR STETKAR: I don't think you did miss
2 any on this one.

3 MS. DROUIN: We tried to go and do,
4 literally, a line-by-line search for subjective terms,
5 and pretty much the thing we found was reasonable and
6 credible. And I can't promise that we caught them
7 all, but we did try and replace -- we thought, after
8 a long discussion, that credible was the better term
9 to use than reasonable.

10 CHAIR STETKAR: Regardless of the word,
11 credible is now defined.

12 MS. DROUIN: And we defined it.

13 CHAIR STETKAR: You defined it. So at
14 least, you know, people may argue with that
15 definition, but you've at least stated what that thing
16 means.

17 MS. DROUIN: Right. And there were places
18 where we thought the term wasn't needed so --

19 CHAIR STETKAR: Right. In some places
20 just --

21 MS. DROUIN: -- in some places, we just
22 got rid of it.

23 CHAIR STETKAR: That's right.

24 MS. DROUIN: But in some places, it really
25 was, and so when it was we went with the term credible

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1 --

2 CHAIR STETKAR: Honestly, Mary, I read
3 through this thing with kind of a fine-tooth comb, and
4 I think you've done a really good job in terms of
5 removing what we raised as a concern about this kind
6 of vague notion of what is reasonable.

7 MS. DROUIN: Right. And then there was
8 the term "broad acceptance" that was used in the
9 definition, and we had a lot of discussion on that,
10 and we finally came to the conclusion it didn't add
11 anything. So we removed it from the definition. But,
12 you know, in terms of subjective terms, that's all we
13 could really find, and we really did take the time and
14 effort to do a thorough scrubbing. So if there are
15 other subjective terms you think we missed, we'd like
16 to hear about them.

17 Okay. Changes to the NUREG, and this is
18 to deal with the definition of sources of model
19 uncertainty. And when you go in on page 18, you'll
20 see there may be cases of more than one consensus
21 model. And I'm trying to remember exactly what we did
22 here.

23 MR. LACHANCE: Let me help you. I think
24 the general comment -- this is Jeff Lachance, by the
25 way. The general comment or one of the general

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1 comments we got was what do we do about the case of
2 consensus model if there's really more than one. And
3 we tried to address that with this language that's
4 shown on the slide, and we recognize that there could
5 be multiple consensus models but the definition of
6 that, if there are, they essentially have to give you
7 similar results. If they don't, then how could they
8 really be, you know, two different consensus models
9 that give you --

10 CHAIR STETKAR: Kind of like MAP and
11 MELCOR.

12 MR. LACHANCE: Yes. We give you orders of
13 magnitude difference, okay? And so we put that into
14 the document, and we also recognize the fact that
15 EPRI, as a document, is listed in the second
16 paragraph. That was the first step in establishing a
17 process for compiling them, okay? It hasn't gone any
18 further than that EPRI document. The NRC hasn't
19 endorsed the models that were identified, but some of
20 them probably have been endorsed in particular
21 applications. And so we added that language.

22 MS. DROUIN: So the other thing is that we
23 don't know, if the time is available, whether it's
24 worth to take the time to start with the list that's
25 in the EPRI document and to try and identify are any

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1 of those consensus models. I don't know if we can
2 come to that kind of agreement in the time frame
3 that's available and whether that would be worthwhile.

4 CHAIR STETKAR: You know, quite honestly,
5 this is my own perspective, I thought this was really
6 good. You didn't point to EPRI as examples, but I
7 kind of agree with you that trying to define what are
8 the officially-sanctioned consensus models might be a
9 rabbit hole that you don't necessarily want to run
10 down right at this time, given the general --

11 MS. DROUIN: It sounded like a good idea
12 when --

13 CHAIR STETKAR: -- resources might be
14 spent much more effectively in other ways. I'd rather
15 see a training. Take those resources and do some
16 training courses on, you know, realistic examples or
17 something. I thought this was really good.

18 MS. DROUIN: And exactly what you said is
19 why we didn't progress further.

20 CHAIR STETKAR: One of the things
21 regarding consensus models -- maybe it's addressed on
22 the next page. Go the next page.

23 MR. LACHANCE: So this part addresses, you
24 know, the definition of source of model uncertainty,
25 and there were some slight changes made to the

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1 definition that was in the previous version.
2 Basically, it sort of indicates the change was made to
3 reflect the fact that a credible assumption could be
4 submitted by a single expert. And what it didn't have
5 to do is it didn't have to receive broad acceptance.
6 That's where we made the major change here. In step
7 one, we removed broad acceptance, and this is the area
8 where we did it because we didn't think that was
9 necessary. A single expert may come up with a very
10 good and credible alternative method. That could be
11 the source of a model, a sensitivity study to address
12 model uncertainty. I think that's the major change
13 that was made here.

14 MS. DROUIN: And we've seen a lot of
15 examples of that in the past, particularly in the
16 seismic area where you have a single expert, you know,
17 that does not have the broad, but it's a source of
18 model uncertainty even though it has not received
19 broad acceptance.

20 CHAIR STETKAR: One of the things, a note
21 that I made to myself as I was going through this, I
22 think the previous slide did a very good job of kind
23 of clarifying this notion of having two nominal
24 credible consensus models, and what does that really
25 mean, and I guess this addresses it. I've been really

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1 sensitive to the thing that I brought up earlier
2 regarding suppose I have one, every consensus model,
3 everybody agrees that this is the best available
4 consensus model, how do I treat the fact that I still
5 have uncertainties in the results from using that
6 model? I'm propagating uncertainties in the
7 parameters that that has --

8 MEMBER SHACK: It should also be noted
9 that the adoption of a consensus model would not
10 negate the need to model any parameter uncertainty.

11 CHAIR STETKAR: Yes, yes. And I think
12 this does it. I think this handles that.

13 MS. DROUIN: It doesn't get rid of the
14 uncertainty. It's just that everybody agrees as to
15 what that uncertainty is, and I think that's what the
16 subtle difference is. Okay. On the third one, we
17 just added some more language to better tie in the
18 different principles of your integrated decision to
19 the PRA and to risk and that they weren't always
20 isolated. You know, they were integrated, so we just
21 brought that clear into the picture. And then we did
22 delete the one picture that you didn't like, and
23 trying to add verbiage to better explain it, it got
24 difficult. And then we stood back and we said, well,
25 you know, the real thing here is the integrated

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1 decision making with the different principles and not
2 this other figure. So we thought it was better off
3 just to --

4 CHAIR STETKAR: Oh, yes, yes, yes, yes.

5 MS. DROUIN: -- keep that figure, which is
6 what we did.

7 CHAIR STETKAR: Yes.

8 MS. DROUIN: When you look at the NUREG,
9 we did say in the scope that, you know, this is
10 limited to this, but the process is generic and is
11 applicable. And then we had the first stage, which
12 goes to where you apply it. And we still acknowledge
13 there that it has a generic process. So what we did
14 is we added a new subsection so that -- and it got
15 into the three main things you have to deal with so
16 that if you got into the block that didn't send you,
17 that this NUREG, that you had to go through the rest
18 and follow it explicitly, we do now have a subsection
19 in there saying, okay, here's how you apply it
20 generically at a higher level.

21 CHAIR STETKAR: One of the questions I had
22 on this, though, Mary, first of all, you may want to
23 read through that section because I had a really
24 difficult time. I sort of saw what you were trying to
25 say, but it didn't flow very well. One of the

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1 comments that we made, and this wasn't changed in the
2 NUREG, there's a statement that says, "Internal NRC
3 activities may use risk results and insights.
4 However, the treatment of the associated risk
5 uncertainties are not subject to the process in this
6 NUREG. While the risk analyses associated with NRC
7 activities do have uncertainties, the treatment of
8 these uncertainties is addressed by a different
9 process that is outside the scope of this NUREG," and
10 now there's a parenthetical "see section 3.4." And
11 there are several -- I mean, when you talk about the
12 Reactor Oversight Process, everything points to this
13 new section which is now a very broad sense of, oh,
14 yeah, you have to think about uncertainties in a
15 systematic way. But I still have a problem of why,
16 internally, the NRC staff doesn't have to go through
17 the same type of systematic assessment of
18 uncertainties that's laid out in this NUREG and now,
19 by implication, in the EPRI report.

20 So, for example, if I'm using a SPAR model
21 to make a decision about the relative risk of
22 something, why don't I, as a staff member, need to
23 also quantify my uncertainties through that SPAR
24 model? Isn't that a PRA?

25 MS. DROUIN: I'm not going to get into

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1 some of those issues. What we are trying to say when
2 you don't have to file a -- 1855 gets very specific of
3 the things you have to think about. But the process
4 itself, you would have to think about that any time
5 you're dealing with uncertainties. So I think what
6 you read is not, we did not word that well enough
7 because it makes it sound like there's something
8 totally different.

9 CHAIR STETKAR: You may want to go back
10 and --

11 MS. DROUIN: And that was not the intent
12 --

13 CHAIR STETKAR: -- read those things
14 because I was trying to be very sensitive to this.
15 And places that I flagged back in June where I thought
16 that the NUREG was promoting this approach, let's say
17 for the industry, and, yet, a different approach ill-
18 defined at that time for internal NRC decision making,
19 every place that I had flagged back in June now has a
20 parenthesis that says "see section 3.4."

21 MS. DROUIN: Right. And what we were
22 trying --

23 CHAIR STETKAR: And 3.4, quite honestly,
24 leaves me a bit empty because 3.4 is just very high
25 level and qualitative and it gives me the impression

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1 that staff decisions, I'll come back to using a SPAR
2 model, that staff input to the decision-making process
3 that's derived from something like using SPAR models
4 for two or three different plants to draw generic
5 conclusions, which is done, are not subject to
6 quantitative evaluation of uncertainty or this
7 systematic process that is, indeed, laid out really
8 well in 1855.

9 MS. DROUIN: Well, the thing that, you
10 know, we have to be careful with in 1855 and why, you
11 know, we may not make you happy is, you know, because
12 we haven't gone through, and I didn't have a problem
13 with writing 3.4 and keeping it high level. Now, we
14 may have erred in keeping it too high level, but it
15 can't get real detailed because we haven't gone
16 through and vetted, you know, is this really, you
17 know, can I just take all the details that are in 1855
18 and say, yes, this is exactly what you would do for
19 SPAR models or for ROP. I know at a high level that
20 you're going to have to understand the activity,
21 you're going to have to understand the sources, you're
22 going to have to address the uncertainty, you know, so
23 that high-level process is certainly applicable.

24 CHAIR STETKAR: Let me ask it a different
25 way is in 1855 and, in particular, the guidance, the

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1 more detailed guidance in the EPRI report, there are
2 many instances that says, well, you need to think
3 about these things but there may be alternative ways
4 to address them. You know, we had this discussion
5 about what does it mean to do a sensitivity analysis
6 or, if you can't estimate the frequency of a cliff
7 edge effect, how you might address that. That's a way
8 to address that uncertainty. Why shouldn't the NRC
9 staff, why shouldn't the guidance just say follow the
10 process in 1855, period? Whether you're NRC staff,
11 whether you're a consultant, whether you're an
12 applicant, what's wrong with that? Why can't the NRC
13 staff do that? Because the process in 1855 and the
14 EPRI reports says, in some cases, you may need to
15 develop alternative arguments rather than a rigorous
16 treatment of uncertainty.

17 MS. DROUIN: I would be hesitant to do
18 that at this point on programs that are well
19 established and, all of a sudden, coming in and
20 telling them, okay, now when you're in your decision
21 making, you need to explicitly do these things that
22 are in 1855. I'm not ready to retire yet.

23 CHAIR STETKAR: It's just -- okay. I hear
24 you. I understand the constraints. But at some
25 level, you know, we pride ourselves as an agency of

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1 using risk information and uncertainty as part of that
2 risk information, and it doesn't quite seem fair in
3 the sense of trying to develop a lot of guidance from
4 what we expect people to deliver to us and not hold
5 ourselves to that same standard, if you will.

6 MS. DROUIN: Right. And I appreciate
7 that. But I guess, from a personal perspective, I
8 also come back to when we wrote 1855 we really had
9 blinders on. We really were thinking, you know, very
10 narrow applications.

11 CHAIR STETKAR: Risk-informed
12 applications. I understand that.

13 MS. DROUIN: And that's where we came
14 from.

15 CHAIR STETKAR: Yes.

16 MS. DROUIN: And so then after doing it we
17 thought, well, you know, this process at a high level,
18 it's pretty generic. So we wanted to communicate
19 that, but we haven't systematically gone through and
20 said, okay, and tried it out in these other
21 applications to say would I want, would I go and
22 change something in one of these chapters for it to
23 fit? And that's what, you know, I would be hesitant
24 about. Mark, do you want to --

25 MR. RUSSO: Perhaps I can add some value

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1 and perhaps not.

2 CHAIR STETKAR: Mark, just for the record,
3 can you --

4 MR. RUSSO: Oh, Mark Russo, NRO. I think,
5 first, I think the point about why shouldn't the NRC
6 live up to the same standards that other organizations
7 do when they do analytical work, everybody in the room
8 agrees that, to the extent that it's appropriate, you
9 know, you should. You know, I think we went through
10 this with QA of the SPAR models and QA of other stuff
11 where, you know, we have strong QA standards, but ten
12 years ago or something we weren't QAing our own
13 things. We were running calculations and making
14 decisions. So I think we agree there.

15 The point I would make is I think perhaps
16 that it's probably more appropriate in whatever
17 guidance exists for the particular application, be it
18 the STP process or be it a calculation of a change in
19 risk or a risk associated with an event, whatever
20 guidance we have for staff in those programs, that
21 that's where they should be looking at, you know, how
22 would one apply this and to what extent should they
23 apply it, if it's, you know, something very, very
24 simple, a risk-informed scoping kind of tool, maybe
25 you don't need to do all this. So I guess what I'm

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1 saying is maybe it's better for this to be the kind of
2 thing that's addressed in the methodology of guidance
3 for a particular application.

4 CHAIR STETKAR: You know, I understand
5 that, but in 1855 there's not, maybe I'm
6 misinterpreting it, but 1855 does not contain that
7 level of specificity. It doesn't say if you're doing
8 a risk-informed submittal for a change in the
9 surveillance interval for a diesel generator of how
10 you should address uncertainty within that, which is
11 what I'm hearing you say that the specific guidance
12 for each application needs to reflect details of the
13 process. This is a much higher document. It says,
14 you know, you have to systematically address
15 uncertainties. Here are the types of uncertainties
16 that you need to consider. You need to consider
17 parameter uncertainties. You need to consider
18 modeling uncertainties, regardless of your own opinion
19 about whether you're closer or far away from a
20 threshold uncertainties may be more or less important
21 to your ultimate decision. And I don't understand
22 why, at that level, it doesn't apply universally.
23 Why, if I'm close to making a decision on STP, of
24 whether I'm green to white or white to yellow or
25 whatever, why it might not be more important to assess

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1 uncertainties. You see numbers coming in that says,
2 well, condition to core damage frequency or
3 probability was 1.23 times 10 to the minus 3, so it's,
4 you know, whatever color it is, without any expression
5 of uncertainty that there's a 90-percent probability
6 that it might still be green. That still might be
7 enough to make the decision that you trip over it to
8 the next level, but it's kind of inconsistent of what
9 we're asking people to do coming in from the outside
10 and submitting things. How you do it, whether it's a
11 significance determination process or other types of
12 application that the agency gets involved in, is more
13 detailed-focused guidance, but I just don't understand
14 why we need the statements in here saying that
15 internal NRC needs some different process of thinking
16 about this stuff at this level, at the level of the
17 guidance in the NUREG. I'll just leave it, you know.

18 MEMBER BLEY: It's not so much saying use
19 it everywhere as not saying don't use it.

20 CHAIR STETKAR: That's right. That's
21 right.

22 MEMBER BLEY: And you can still keep your
23 job.

24 MS. DROUIN: I was being facetious there.

25 MEMBER BLEY: Can I ask a specific

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1 question?

2 MS. DROUIN: Sure.

3 MEMBER BLEY: This new section I don't
4 think got reflected up into the abstract.

5 MS. DROUIN: You know, you're probably
6 right.

7 MEMBER BLEY: And I think right at the end
8 of the first paragraph of the abstract another
9 sentence or two would do it because you'll be talking
10 to the rest of staff, and getting it out in front I
11 think is useful.

12 MS. DROUIN: You're correct. I did not
13 catch the abstract.

14 MEMBER BLEY: And the way that first
15 paragraph is written, it almost invites the next
16 sentence that says and, therefore, it could be used
17 more generally.

18 MS. DROUIN: Okay. The next one on
19 bounding analyses.

20 MR. LACHANCE: Yes, Jeff LaChance. This
21 one is we just sort of added an extra paragraph there
22 to try to provide a little bit more explanation. That
23 extra paragraph sort of addresses the fact that, you
24 know, in reality, when you do a bounding analysis, it
25 might represent, on a probabilistic level, you know,

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1 some high percentage on distribution. But I also
2 recognize that's not practical to do that, okay,
3 specify a percentile in the definition of a bounding
4 assessment, even though it may turn out to be closed
5 to one. But it also leaves open the option that,
6 well, for specific parameters, you could use a 95th
7 percentile and say, well, that's close to my bounding
8 assessment. And so it just adds a little bit more
9 guidance on what to do here.

10 CHAIR STETKAR: I thought this --

11 MS. DROUIN: Well, also --

12 CHAIR STETKAR: We kicked around a couple
13 of different ideas but I . . .

14 MS. DROUIN: And we thought it was
15 important to, in this section, to keep separate and
16 have a definition for your bounding analysis versus a
17 conservative analysis versus a realistic, but those
18 are three distinct things and we needed good
19 definitions for them. So we did get rid of the
20 frequency side, but I think we incorporated it a
21 little bit differently.

22 MR. LACHANCE: Well, actually, where it
23 says we removed that text, that one sentence, because
24 it was redundant.

25 CHAIR STETKAR: That one was, yes. But

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1 the definition now gets it very much closer to this
2 notion of the worst credible outcome and so forth,
3 which I think was in there but not as succinctly.

4 MS. DROUIN: So we can go on to six then.

5 CHAIR STETKAR: Mary?

6 MS. PRESLEY: Sorry. We had a question on
7 the last slide. So, for example, a bounding scenario
8 may be defined utilizing a bounding frequency assumed
9 failure of available mitigating systems, so that
10 sentence, that last sentence, second to last sentence.
11 That may be a little bit inconsistent with what we've
12 been calling them, and I don't know if we used the
13 word bounding but we would use a bounding consequence
14 and a realistic or conservative frequency, and we
15 would call that a bounding scenario, as well. So I
16 just wanted to make sure we're not being inconsistent
17 or if we need to tweak our terminology.

18 CHAIR STETKAR: That's something you can
19 probably work out between you.

20 MS. DROUIN: Right. We'll take a note and
21 we'll work that out with you.

22 CHAIR STETKAR: You don't need to
23 struggle. You did good here.

24 MS. DROUIN: Okay. I'm sorry. I'm not my

25 --

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1 CHAIR STETKAR: That's okay. This was the
2 whole notion about at least instilling the sensitivity
3 to the notion that looking at the cut sets that you
4 can examine might not be sufficient to examine the
5 effects of the state of knowledge correlation, that
6 your truncation frequency might have suppressed those
7 cut sets, and the revised words at least instill that
8 notion. It does it. It was adequate.

9 MR. LACHANCE: But to be fair, in the
10 previous version, we actually did have some wording in
11 there along these lines, but we just amplified it a
12 little bit more.

13 MEMBER BLEY: If only you didn't have to
14 use the SOKC acronym. I hate it.

15 CHAIR STETKAR: You probably coined the
16 phrase. We've already talked about this, that . . .

17 MR. LACHANCE: Yes, on seven, really in
18 the first part we mention, actually for number one,
19 that we already replaced reasonable with credible.
20 But the real question that we're trying to address
21 here --

22 MS. DROUIN: It's not reflected correctly
23 on the slide.

24 MR. LACHANCE: -- was that, you know,
25 revisit the discussion on the reasonable alternative

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1 for a sensitivity analysis. We had some discussion
2 with EPRI, and I think we came to the conclusion that
3 the EPRI guidance was pretty good with regard to this.
4 And so we just simply referred to the EPRI documents
5 for that.

6 MEMBER SHACK: You're consistent that way.

7 CHAIR STETKAR: I know what you did.

8 MS. DROUIN: Okay. Where are we now? As
9 I started off, we're in the midst. Hopefully, it will
10 go out any day now with two-week notification to the
11 program offices. Once we hit that two weeks, then it
12 goes into the process to go to publications, and
13 that's anywhere from three to five days to get through
14 that. So looking at, you know, two to three weeks
15 before this actually comes out. So we go out for a
16 two-month public period ending at the end of December,
17 and then we would come back in January, address at
18 that time both NRR and NRO comments. We've gotten a
19 few NRR comments --

20 CHAIR STETKAR: What we've seen has not
21 yet incorporated the NRR or NRO comments?

22 MS. DROUIN: NRR and NRO have been heavily
23 involved in this, but we send it to them formally for
24 their comments. I mean, over the time frames, we've
25 had numerous meetings, numerous discussions, showing

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1 them what we've done, gotten their feedback in
2 realtime, but now it goes to them for formal and it
3 was sent to them for formal --

4 CHAIR STETKAR: So, in principle, there
5 shouldn't be any surprises --

6 MS. DROUIN: No, there should not be any
7 surprises, any surprises.

8 CHAIR STETKAR: We can never say never.
9 Okay.

10 MS. DROUIN: So I would anticipate not
11 receiving any comments from them formally, but if
12 there are any they'll be addressed during, you know,
13 with the public review and comment. So we're looking
14 for this to be published in early 2013.

15 MR. GILBERTSON: I would just mildly
16 qualify that. I mean, our publications branch has
17 expressed that they have a fair queue of documents to
18 review, so we'll be getting it to them as soon as we
19 can.

20 CHAIR STETKAR: Nothing that's within the
21 realm of your control, I understand.

22 MR. GILBERTSON: They have assured to a
23 certain degree that we would probably have a November
24 or December publication date for the draft.

25 MS. DROUIN: And what they do is that they

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1 go through and they make sure the table of contents,
2 those page numbers, that's really the right page
3 number. So, I mean, they don't read the document.
4 You know, they're looking at it at that high level,
5 you know, has it been assembled correctly --

6 CHAIR STETKAR: Okay. Offline, I caught
7 a couple of editorial things that I'll share with you
8 offline.

9 MS. DROUIN: Okay.

10 CHAIR STETKAR: We don't need to do it in
11 this forum.

12 MS. DROUIN: So that's where we're at.

13 CHAIR STETKAR: Great. Any questions for
14 the staff? If not, thank you very much.

15 MS. DROUIN: Thank you.

16 CHAIR STETKAR: Appreciate that. And as
17 we usually do for the Subcommittee, what I'd like to
18 do is go around the table and see if any of the
19 members have any comments and questions. But, first,
20 since we have a consultant here, I'll put him on the
21 spot and ask him first. So Mario?

22 DR. BONACA: No, I thought your argument
23 at the end of this project, but I thought that it was
24 well organized and the presentation was usable. And
25 I think that it will be a big help in the industry

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1 with the PRA. So I have no other comments.

2 CHAIR STETKAR: Thank you. Dennis?

3 MEMBER BLEY: Yes, I just want to thank
4 everybody. It's been an interesting day, and this has
5 come a long way. I really like it. I think with
6 respect to the examples and things, we aren't ever
7 going to be perfect. But a few more caveats in, as
8 we've talked, I think that will help. I'll only
9 express my disappointment that very few people from
10 the staff were at this meeting all day, and somehow
11 the word on what has to get spread pretty far because
12 it does have broad applicability. And there's lots of
13 people who still come and talk to us and say, oh,
14 there's no way to even think about those things, and
15 you've given them a pretty good framework for
16 thinking. Thanks.

17 CHAIR STETKAR: Bill?

18 MEMBER SHACK: I'll just echo what Dennis
19 said. I think it's come a long way. I hope it gets
20 put to use.

21 CHAIR STETKAR: And me, too. It's one of
22 the reasons why I've been as animated as I am about
23 those excerpting those phrases about NRC staff using
24 other processes because I thought that that example
25 that I've cited a couple of times from the fire

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1 modeling stuff, had it not been for a lot of prodding,
2 that example would not have existed because there was
3 no sense of the fact that we need to account for
4 uncertainties at that level. The document at another
5 level accounted for uncertainties in modeling.

6 So I'd echo Dennis' notion that I think
7 this is really good, and it does have broad
8 applicability and people ought not to be given a free
9 out on --

10 MS. DROUIN: I have a question. You know,
11 it was actually the ACRS that started this program way
12 back when. You all sent us a letter. I don't know if
13 you were planning on writing a letter on this --

14 CHAIR STETKAR: I think that's -- okay.
15 We have a December full committee meeting scheduled on
16 this topic. Don't look at me as if you're surprised.
17 It's on the schedule.

18 MS. DROUIN: No, I didn't know that.

19 CHAIR STETKAR: Talk among yourselves.
20 You're actually on our agenda for the December full
21 committee.

22 MR. LAI: I've actually sent you several
23 emails talking about it.

24 MS. DROUIN: You know, I will tell you,
25 I'm dealing with so many things right now, it's very

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1 easy for an email to slip. And I know you're very
2 good about keeping informed. I'm sure it's there.

3 CHAIR STETKAR: You're on the agenda.
4 Now, whether we write a letter is something we need to
5 discuss internally, and I can't give you, you know, a
6 notion on that right now, quite honestly. I mean, I
7 think even if it were a short letter just saying it's
8 really good it might benefit a lot of people, but
9 that's my own opinion. I can't give you a statement
10 on it. By the way, just simply, if you come before
11 the full committee, it doesn't necessarily mean we'll
12 write a letter either.

13 MS. DROUIN: I recognize that. That's why
14 I was . . .

15 CHAIR STETKAR: But you are on the agenda,
16 and if that's going to change we need to know about
17 it. And right now I'm personally open. I don't know
18 whether we'll write one or not. One last thing I'd
19 like to say is just to reiterate if there's any way
20 that EPRI can re-read your report with a really
21 cynical set of goggles on and try to see where people
22 might misinterpret it as the bare minimum that's
23 necessary and sufficient. And I recognize you can't
24 put enough caveats in there, in practice, to resolve
25 that problem. You can't have enough examples. You

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1 know, you just can't. But there might be a few ways
2 that you can recast a few things without too much work
3 to at least better thwart off that sort of mind set.
4 It might help.

5 With that, thank you again. I appreciate
6 it, especially on a Friday afternoon. And we are
7 adjourned.

8 (Whereupon, the foregoing matter was
9 concluded at 4:54 p.m.)

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Practical Guidance on the Use of PRA in Risk-Informed Submittals with a Focus on the Treatment of Uncertainties [1026511]

Mary Presley EPRI

Gareth Parry, Doug True, Don Vanover ERIN Engineering

Advisory Committee on Reactor Safeguards Reliability and PRA Subcommittee Meeting

October 19, 2012

Overview

- Project History
- Ongoing Collaboration with the NRC
- New EPRI Guidance
- Next Steps

Project History

- Complementary documents addressing uncertainty analysis in risk-informed decision making using PRAs were prepared under a memorandum of understanding between EPRI and the Office of Research of NRC
 - NUREG-1855, Revision 0, *Guidelines on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making*, March 2009
 - EPRI 1016737, *Treatment of Parameter and Model Uncertainty for Probabilistic Risk Assessments*, 2008
 - Guidance on SOKC and characterizing model uncertainty
 - Lists generic sources of model uncertainty in internal events
- Prior work by EPRI provided significant technical information
 - EPRI 1013491, *Guideline for the Treatment of Uncertainty in Risk-Informed Applications: Applications Guide*, 2006

Ongoing Collaboration with NRC

- NRC decided, based on comments from NRR and NRO to produce Revision 1 to NUREG-1855.
 - Revision 1 is a reorganization of Revision 0
 - EPRI document is intended as a companion to the revision; it takes the stages defined in NUREG-1855, Revision 1 and demonstrates how and when to apply them
- Expansion of list of generic sources of model uncertainty needed to expand scope
 - NRC/EPRI sponsored a workshop (February 28 – March 1) to solicit input to identification of sources of uncertainty in PRAs for fires, seismic, low power and shutdown and Level 2

New EPRI Guidance

- A pragmatic approach to developing a risk-informed proposal factoring in the uncertainties in the PRA results for the purpose of risk-informed decision making
 - Decomposition and interpretation of PRA results
 - A graded approach to dealing with parameter & model uncertainty based on Regimes (NUREG 1855, Rev 1)
 - Interaction between principles of risk-informed decision-making
 - Dealing with large uncertainties
- Example Implementation (Appendix A)
- Expanded tables on sources of model uncertainty for:
 - Seismic hazard group (Appendix B)
 - Fire hazard group (Appendix C)
 - LPSD operational states (Appendix D)
 - Level 2 (Appendix E)

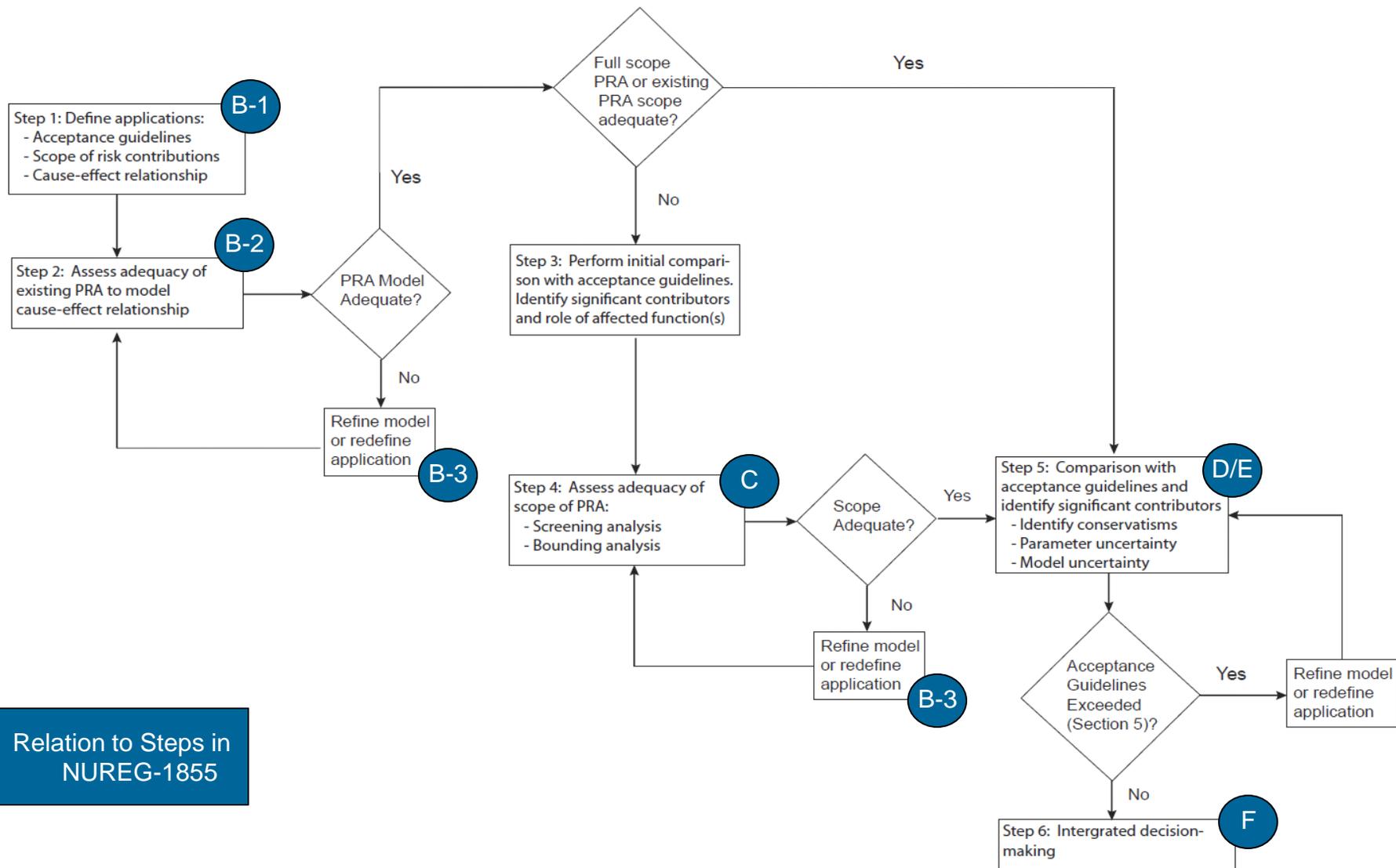
Assumptions

- Risk-informed submittal is developed in accordance with guidance documents such as RG 1.174
- Generally such submittals require considerations of all contributors to risk (e.g., all hazards and POSs)
- Currently very few licensees have a full scope (all hazards, all POSs) PRA
 - Process developed to facilitate screening or bounding of missing scope items
 - These steps can be bypassed for a full scope PRA or a PRA of sufficient scope for the application
- Guidance needed on interplay of principles of risk-informed regulation, particularly the DID principle

Assumptions (Cont'd)

- The starting point will be a PRA that *as a minimum* addresses internal events and internal flooding hazard groups AND
- The base PRA will have been peer reviewed against the ASME/ANS standard and RG 1.200, Rev 2
- Some iteration on technical adequacy can be expected
 - The technical adequacy of the PRA model for the application is assessed taking into account the significance of the elements of the model to the risk metrics required for the application

Process for Assessment of PRA Results for the Purpose of Risk-Informed Decision Making



Relation to Steps in NUREG-1855

Steps 1 and 2: Define Application and Assess Capability of PRA to Model the Cause-effect Relationship*

- Step 1: Identify appropriate guidance documents for the application to determine:
 - Acceptance guidelines (risk metrics)
 - Hazards/POSSs to be considered
 - Some applications can be hazard specific (e.g., NFPA 805)
 - Cause-effect relationship (modeling the impact of the change)
- Step 2: Check to see the PRA model has the right “hooks”

* (NUREG-1855 Stage B)

Step 3: Initial Comparison of PRA Results with Acceptance Guidelines*

- Necessary when the scope of the PRA does not address all the risk contributors required by the acceptance guidelines
- Quantitative results give an indication of the margin to the acceptance guidelines
- An analysis of the results identifies the initiating events, accident sequences, and functions and systems whose unavailabilities have an impact on the risk metrics for use in the screening and bounding analyses conducted in Step 4

* This step and step 4 are skipped when the PRA is full scope or is of sufficient scope for the application

Step 4: Assess Adequacy of the Scope of the PRA*

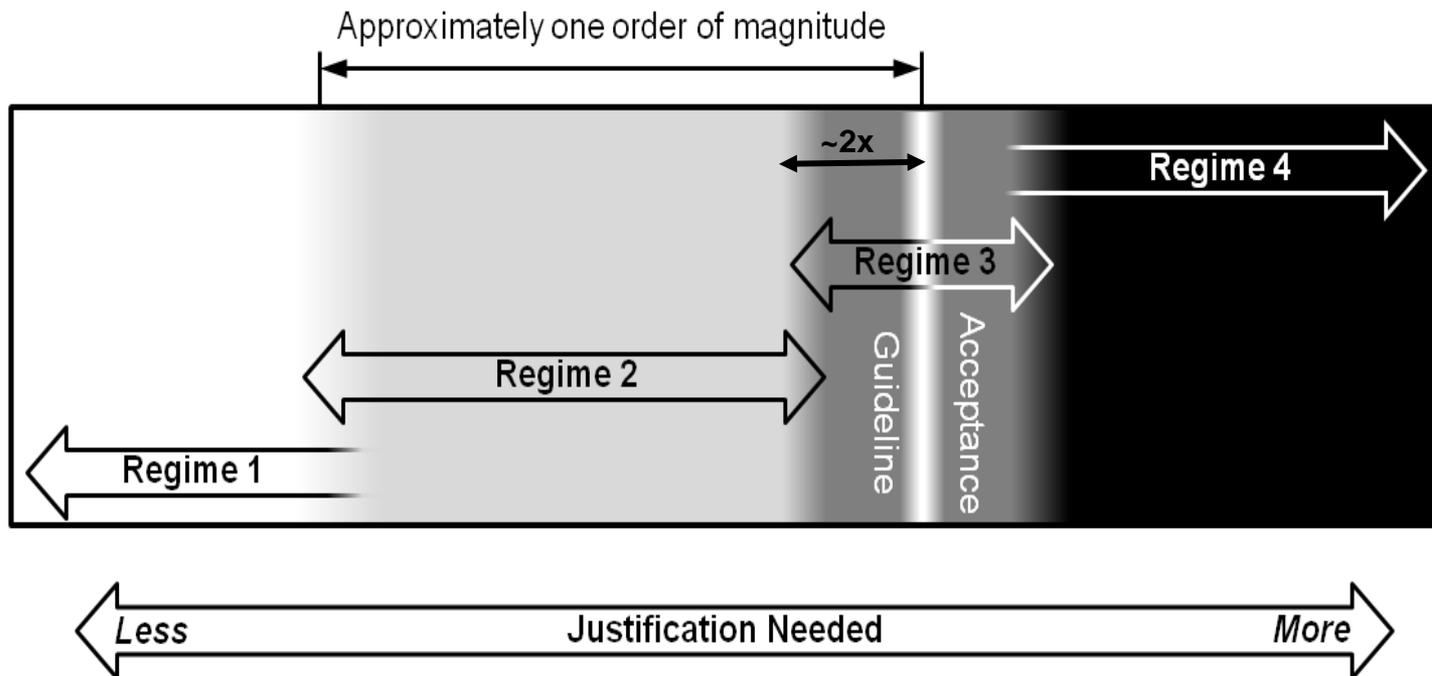
- The purpose of this step is to assess whether the missing scope (hazard groups or POSs) items can be screened or their contributions to the risk metrics bounded so that they are not significant contributors
 - Approach varies with application and hazard: *examples* are given in Appendix A for a particular application and plant but are not intended as definitive guidance
 - If neither cannot be demonstrated, then either a PRA model is constructed, or, if possible, the implementation of the proposed change is restricted so that the contributions from the missing scope items can be neglected
- * (NUREG 1855 Stage B-3, C)

Step 5: Final Comparison with the Acceptance Guidelines

- Described in Chapter 4 of the report following largely the guidance in EPRI 1016737 addressing both parameter and model uncertainty
- Includes a graded approach to addressing uncertainty depending on where the point estimate results lie with respect to the Regimes defined in NUREG-1855, Rev 1 Chapter 9

A Graded Approach to Dealing with Uncertainty

- Initial assessment (steps 3 and 4) and comparison against acceptance guidelines (step 5) using point estimates
 - Assignment based on conservative results if sensitivity studies show decision at “boundary” between regimes.



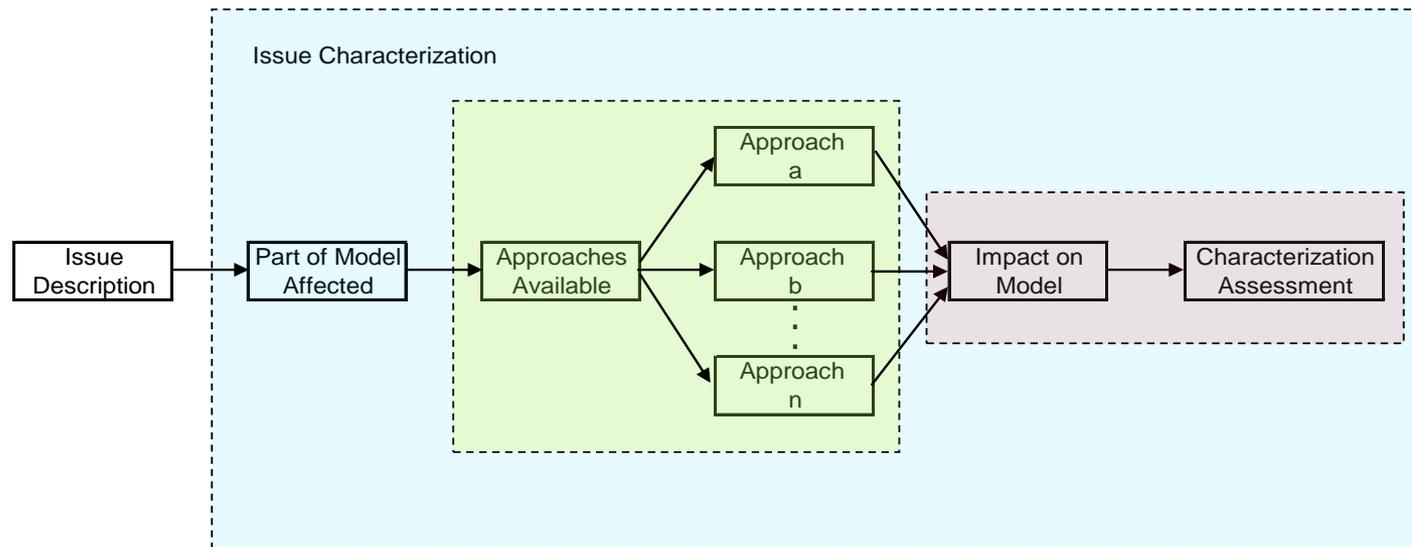
A Graded Approach to Dealing with Uncertainty (2)

- In Step 5 address uncertainties:
 - When results are far from the acceptance guidelines, parameter uncertainty is generally unimportant (except where it obviously is (e.g., ISLOCA))
 - Propagate mean values, perform qualitative assessment of SOKC
 - Within a factor of two assess how to address the SOKC using guidance in the EPRI documents (e.g., 1016737)
 - If SOKC appears to be important according to the EPRI guidance, perform a quantitative assessment of parameter uncertainty
 - As model uncertainties may be large, they must be assessed in all regimes
 - Guidance on this assessment provided in Ch. 4 (next slides)
 - Generic sources of model uncertainty to consider provided in EPRI 1016737 as well as this document.

* (NUREG 1855 Stage D, E)

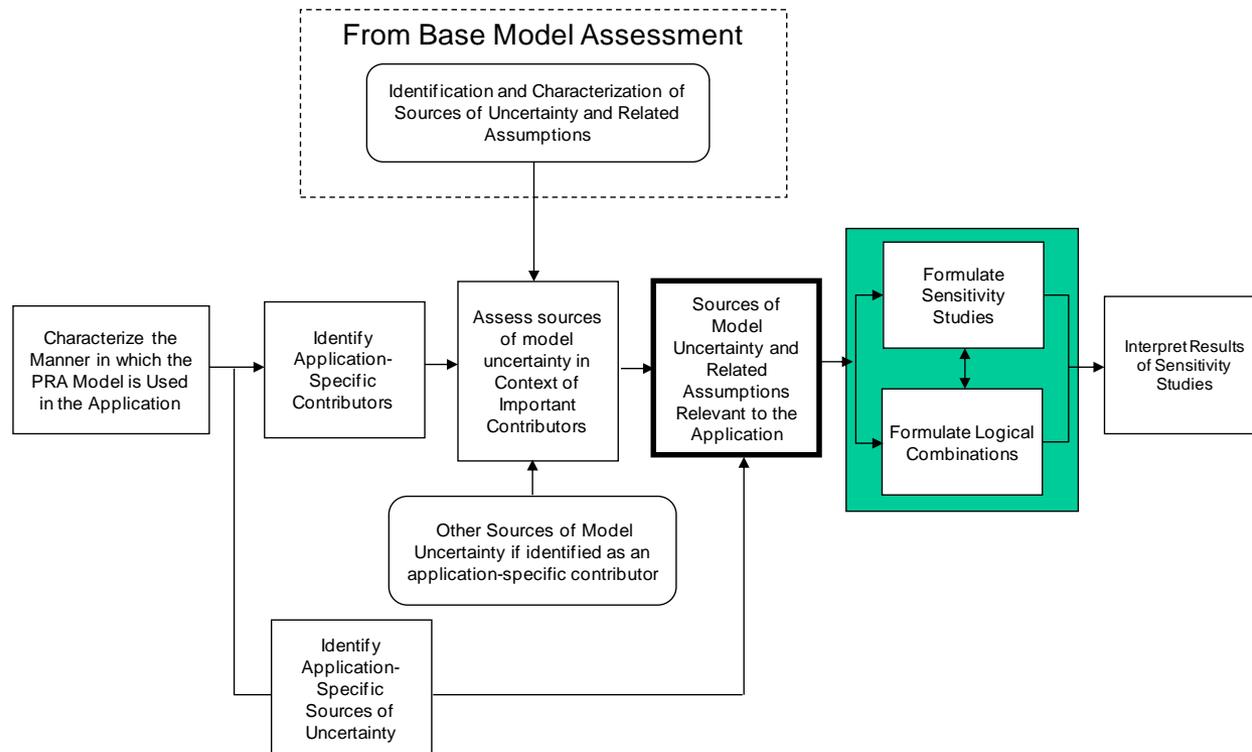
Approach for Characterizing Model Uncertainty

- Similar to approach in EPRI 1016737, but expanded to encompass fire, seismic, LPSD, and Level 2 (as applicable)
- Base Model Assessment



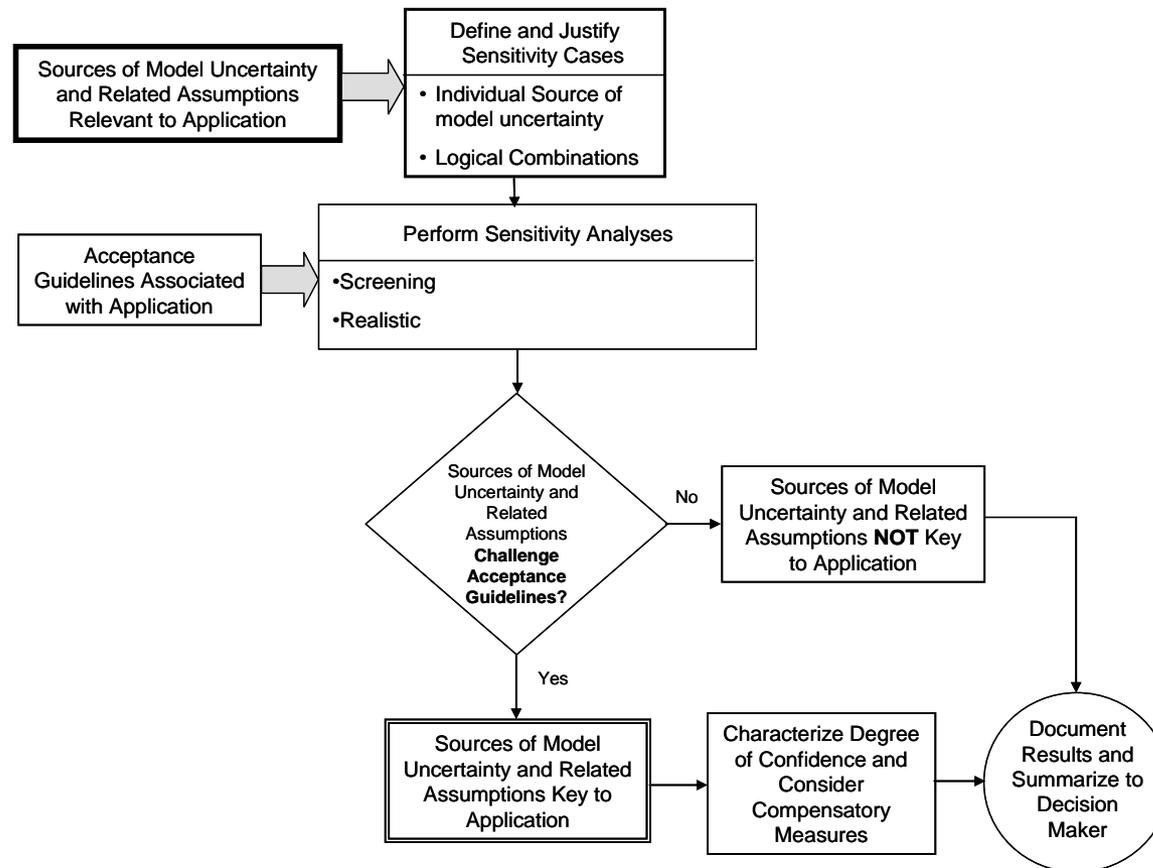
Approach for Dealing with Model Uncertainty

- Process for identifying potential key sources of uncertainty in applications



Approach for Dealing with Model Uncertainty

- Process for identifying potential key sources of uncertainty in applications (cont'd)



Step 6: Integrated Decision-making

- Discussed in Chapter 5 of the report
- Topics addressed include:
 - Comparison of the results to the guidelines
 - Characterization of results for the decision-maker, and options for when the guidelines are challenged
 - Integration of the PRA results with the other principles of risk-informed regulation (RG 1.174)
 - Defense-in-depth
 - Dealing with large uncertainties

* (NUREG 1855 Stage F)

Integrated Assessment

- Integrated assessment based on the five principles of risk-informed decision-making (RG 1.174):
 1. The proposed change meets the current regulations unless it is explicitly related to a requested exemption (i.e., a “specific exemption” under 10CFR 50.12, “Specific Exemptions”).
 2. The proposed change is consistent with a **defense-in-depth** philosophy.
 3. The proposed change maintains sufficient safety margins.
 4. **When proposed changes result in an increase in core damage frequency or risk, the increases should be small and consistent with the intent of the Commission’s Safety Goal Policy Statement.**
 5. The impact of the proposed change should be monitored using **performance measurement** strategies.
- Specific topics addressed are DID and large uncertainties since they are potentially the most contentious

Proposed Approach for addressing DID*

- Develop guidance that recognizes the hierarchical aspect of DID
- Recognize its role in addressing unknown factors
- Focus on the way the LAR affects the presumed balance between the levels of protection:
 - Physical changes to the plant
 - Changes to operating practices
- Provide guidance on the integration of DID concerns with the other principles
 - Dealing with the unknown

** This approach has not been endorsed by NRC*

The Role of DID in an Integrated Decision

- Identify and assess changes that may adversely affect achieving a required safety function when the level of redundancy or diversity is limited or where significant uncertainty exists,
- Identify and assess the impact on DID of cross-cutting changes (e.g., administrative changes, maintenance practices) that affect multiple safety functions or cut across levels of protection
- Use for things that can not be addressed directly by the PRA, e.g., late containment failures

Interaction with other Principles – Principle 4 _

Change in Risk is Small

- Meeting the acceptance guidelines of Principle 4 demonstrates that, at an integral level, DID is maintained for issues related to CDF and LERF, and that are represented in the PRA
- However, if the change affects only low frequency and low order cut sets, DID is still a relevant consideration
 - Contrast proposals for a change to surveillance frequency on RPV with change to surveillance frequency on LPCS system (BWR)
 - Former appears in single element cut sets, the latter in cut sets of high order, i.e., other systems perform the same function
 - Furthermore, there is much more uncertainty about the RPV failure probability than that of the LPCI system
 - Therefore, while the change for the RPV might be allowed, the case would need to be much stronger

Addressing Large Uncertainties

- Problem statement – results from:
 - Paucity of data
 - Need for extrapolation (e.g., flooding) and/or use of models (e.g., seismic)
- Manifestation in PRA models
 - Hazard characterization
 - Characterization of impact
 - Characterization of response to hazard (e.g., HRA)
- Special case – cliff edge effects
 - A small change in hazard results in a large change in impact (e.g., CCDP)

Large Uncertainties (Cont'd)

- Process for addressing large uncertainties
 - Step 1: Understand role in decision-making
 - Step 2: Understand potential to affect decision
 - Step 3: Disposition
 - Step 4: Integration with other principles
 - Defense-in-depth
 - Safety margins
 - Performance monitoring

Large Uncertainties – Steps 2 & 3

	Potential for Large Uncertainties	Disposition
1	Potential Over-estimation of Computed Risk	See 2 & 3
2	Known Over-estimation of Risk Impact	Describe impact of conservatism in application
3	Masking of Change in Risk	Sensitivity study that removes the conservative treatment
4	Potential Under-estimation of Computed Risk	Sensitivity of the risk metrics to changes in the mean estimate – is it reasonable to assume that these sources of large uncertainty do not present a threat to the decision?
5	Cliff-Edge	“Reverse Engineer” hazard likelihood

Results Decomposition (Chapter 3)

- The contributors to the risk metrics are identified
 - Hazard groups
 - Initiating events
 - Accident sequences/classes
 - Functions/systems
 - Cut sets
- Required for
 - Step 3 to identify risk drivers during screening
 - Step 4 to construct the bounding analyses
 - Step 5 to identify:
 - Sources of uncertainty that could influence the result (key sources)
 - Portions of the PRA model treated conservatively and possibly distorting the conclusions
 - Assessment of significance of SOKC

Appendices

- Appendix A: Example Implementation in a Risk-Informed Regulatory Application [RHR example]
- Appendix B: Generic Sources of Fire PRA Modeling Uncertainty
- Appendix C: Generic Sources of Seismic PRA Modeling Uncertainty
- Appendix D: Generic Sources of LPSD PRA Modeling Uncertainty
- Appendix E: Generic Sources of Level 2 PRA Modeling Uncertainty

Issue Description		Issue Characterization	
Topic	Discussion of Issue	Part of Model Affected	Possible Approaches for Model Uncertainty Issues (Not Exhaustive)
Plant Operational State Definitions (LPOS)			
1. Omission of POSs needed to complete evolutions resulting from safe stable states from at-power scenarios	Some level 1 scenarios end in a safe-stable state, such as successful feed and bleed, successful shutdown to terminate SG tube leak, or sump recirculation following a LOCA. These may lead to prolonged shutdown to allow for repair. While they are low frequency scenarios, the complete cycle to restoration of power is not generally modeled.	This is associated with the characterization of shutdown POSs, and represents a level of detail or completeness issue.	N/A – Level of Detail

Next Steps

- EPRI document 1026511 was sent out for review by the EPRI scope and quality working group and to NRC
- No fundamental issues were raised, but the comments received were helpful in identifying where the document lacked clarity, and will be addressed before publication.
- Publication is planned for December, 2012 (prior to anticipated release of NUREG-1855, Rev. 1)
 - *NRC needs to publish draft prior to December 2012.*



Revision 1 to NUREG-1855, “Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decisionmaking”

Presented to ACRS Subcommittee on PRA

October 19, 2012

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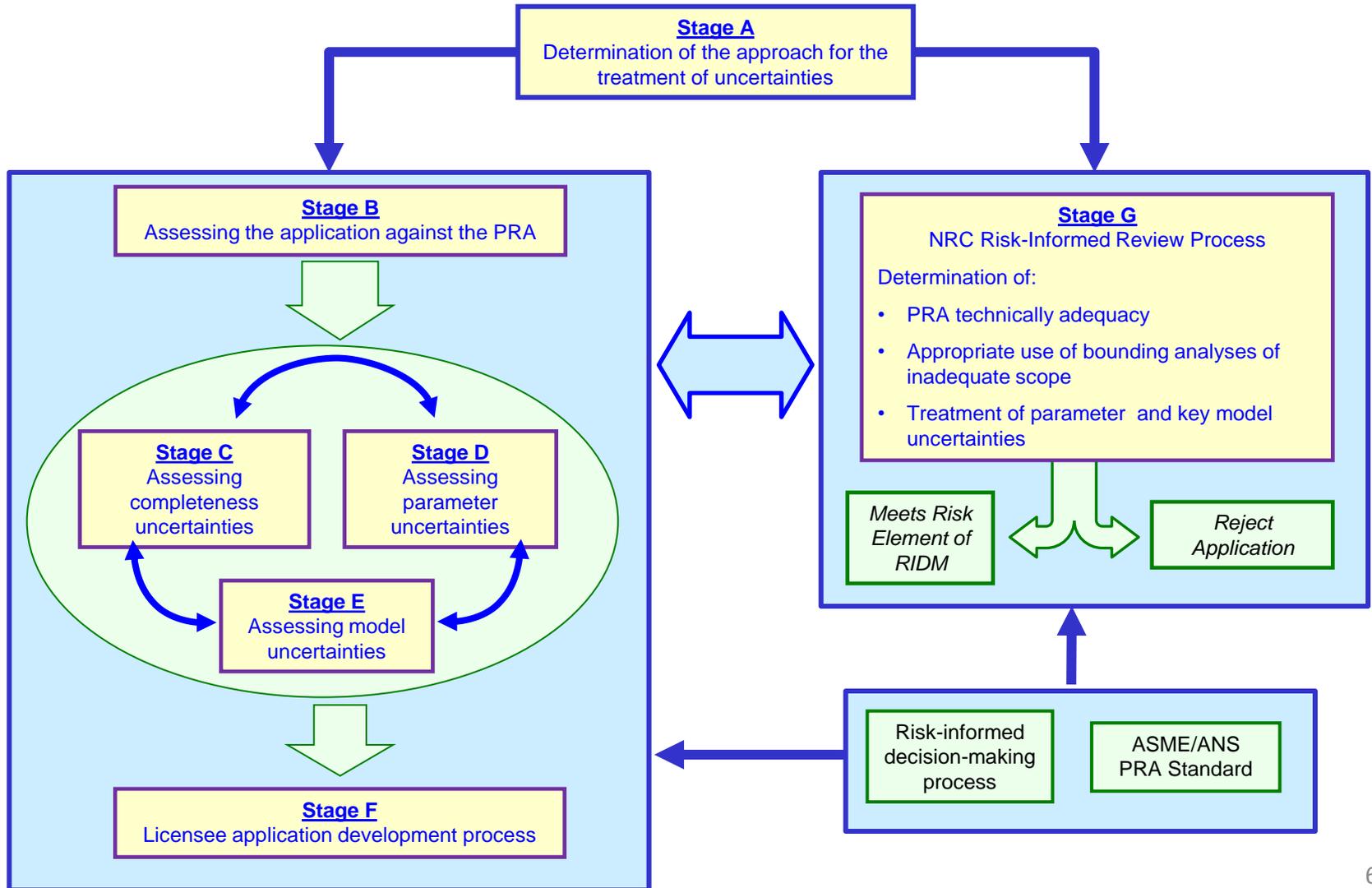
- ❑ Objectives
- ❑ Background
- ❑ NUREG Restructure
- ❑ ACRS Feedback
- ❑ Changes to NUREG
- ❑ Steps Forward

- ❑ Objectives – provide guidance with regard to:
 - identifying and characterizing the uncertainties associated with PRA
 - performing uncertainty analyses to understand the impact of the uncertainties on the results of the PRA
 - factoring the results of the uncertainty analyses into the decisionmaking

- ❑ NRC and EPRI, under an MOU, have developed companion guidance documents which are meant to complement each other and are intended to be used as such when assessing the treatment of uncertainties in PRAs used in risk-informed decisionmaking.

- ❑ Major changes involved a restructuring of the document and development of an explicit process which describes the guidance for the treatment of the uncertainties.
- ❑ The scope was expanded to include sources of uncertainties associated with low power and shutdown, internal fire, seismic, and Level 2 PRA
 - The expanded scope primarily affected the EPRI report.
- ❑ Met with subcommittee on June 19, 2012 to present progress.
- ❑ ACRS provided feedback and NUREG was revised.

NUREG RESTRICTURE



SUMMARY OF FEEDBACK FROM ACRS SUBCOMMITTEE

1. Re-evaluate use of subjective terms
2. Address issues regarding sources of model uncertainty (i.e., definition thereof, consensus models)
3. Clarify the relationship of uncertainty in PRA and deterministic analyses with defense-in-depth and safety margins
4. Consider inclusion of a more generic and global process that is applicable to all risk-informed decisions/activities including those performed by the NRC
5. Expand discussion of bounding, conservative, and realistic analyses (i.e., definitions, examples used)
6. Re-evaluate discussion on the process of truncating and subsequently determining the importance of the SOKC
7. Revisit the discussion of a “reasonable alternative” for a sensitivity analysis

CHANGES TO THE NUREG

1. NUREG was reviewed for subjective terms and revised.
 - The term “reasonable” was replaced with “credible” and a definition for credible was provided
 - The term “broad acceptance” was removed from the definition of source of model uncertainty (see page 86).

CHANGES TO THE NUREG

2. Revisions made to address issues with the definition of sources of model uncertainty and consensus models as well as the treatment of model uncertainties for consensus models.
 - *From page 18:* There may be cases where there may be more than one consensus model for addressing a specific issue. An example is the Multiple Greek Letter and the Alpha methods for quantifying common cause failures. In such a case, any one of the consensus models can be used. Multiple consensus models should provide similar results. If they do not, then they do not meet the requirement for being a consensus model and an evaluation of the associated model uncertainty should be made utilizing the guidance in Section 7.

Currently there is no agreed-on list of consensus models nor is there a formal process to establish such a list. However, as a first step in establishing such a process, EPRI has compiled a list of candidate consensus models [EPRI, 2006a]. This list includes common approaches, models, and sources of data used in PRAs. At this time, the NRC has not reviewed this list although specific models, approaches and data may have been approved for specific risk-informed applications.

CHANGES TO THE NUREG

2. (Con't) Revisions made to address issues with the definition of sources of model uncertainty and consensus models as well as the treatment of model uncertainties for consensus models.
 - *From page 86: A **source of model uncertainty** exists when (1) a credible assumption (decision or judgment) is made regarding the choice of the data, approach, or model used to address an issue because there is no consensus and (2) the choice of alternative data, approaches or models is known to have an impact on the PRA model and results. An impact on the PRA model could include the introduction of a new basic event, changes to basic event probabilities, change in success criteria, or introduction of a new initiating event. A credible assumption is one submitted by relevant experts and which has a sound technical basis. Relevant experts includes those individuals with explicit knowledge and experience for the given issue. An example of an assumption related to a source of model uncertainty is battery depletion time. In calculating the depletion time, the analyst may not have any data on the time required to shed loads and thus may assume (based on analyses) that the operator is able to shed certain electrical loads in a specified time.*

CHANGES TO THE NUREG

3. Revisions made to clarify the relationship of uncertainty in PRA and deterministic analyses with defense-in-depth and safety margins
 - *From pages 20-21:* Appropriate consideration of the uncertainty in both deterministic and probabilistic assessments is required to properly interpret the results. Both the deterministic and probabilistic components implement Principles 2 and 3, which take into account the impact on defense-in-depth and on safety margins. The probabilistic component implements Principle 4, acceptable risk impact. A treatment of the uncertainties in the probabilistic analysis is implicitly required to implement Principles 2, 3, and 4 of risk-informed decisionmaking. Treatment of probabilistic analysis uncertainties is the focus of this report. Although uncertainties in a deterministic analysis are not explicitly addressed in this report, the types of uncertainties and the methods for evaluating them are the same for a deterministic assessment.

CHANGES TO THE NUREG

4. A new subsection describing the generic application of the treatment of uncertainties was added to Section 3, which includes the following three parts:
 - Understanding the risk-informed activity
 - Understanding the sources of uncertainty
 - Addressing the uncertainties in the decision making

CHANGES TO THE NUREG

5. Expanded the discussion of bounding analyses.
 - *From pages 54-55:* In the context of a specific PRA scope or level-of-detail item, a bounding analysis provides an upper limit of the risk metrics and includes the worst credible outcome of all known possible outcomes that result from the risk assessment of that item.

The following text was removed from pages 54:

Consequently, a bounding analysis must consider both the frequency of the event and the outcome of the event.

CHANGES TO THE NUREG

5. (Con't) Expanded the discussion of bounding analyses.
 - *From page 53-54:* Performance of a bounding analysis utilizes available knowledge to set an upper limit on where the answer may realistically lie. When compared to a best estimate probabilistic evaluation, a bounding value may represent a 95%, 98%, or some other percentile of the best estimate value. However, it is not practical to establish a specified percentile in the definition of a bounding analysis since one could only meet that definition by performing a best estimate analysis. Instead, a bounding analysis can only provide a point estimate of the risk metric associated with a missing scope or level-of-detail item. To accomplish this, a bounding analysis can be broken down into individual constituent parts with bounding values, assumptions, and models utilized in each piece of the evaluation. For example, a bounding scenario may be defined utilizing a bounding initiator frequency, assumed failure of available mitigating systems, and a maximum possible release of hazardous material. If the uncertainty distribution is available for one of the parameters such as the initiator frequency, a value representing a high percentile (e.g., 95th percentile) could be selected as a bounding value.

CHANGES TO THE NUREG

6. Revised discussion on the process of truncating and subsequently determining the importance of the SOKC.

- *From page 71:* ...When the basic event mean values and uncertainty distributions are propagated in the PRA model without accounting for the SOKC, the calculated mean value of the relevant risk metric and the uncertainty about this mean value will be underestimated. The values can be underestimated due to the effect of the SOKC directly, as well as due to incorrect screening out of cutsets in truncation due to neglect of the SOKC in calculating cutset frequencies. Appendix 6-A of this section discusses both these potential effects of the SOKC in more detail...

From page 75: ...It should be noted here that, due to the large number of cutsets in a PRA model, it is common to screen out cutsets with frequencies below a certain truncation value at this point in the analysis. Caution needs to be exercised to avoid incorrect screening out of cutsets in truncation due to neglect of the SOKC in calculating their frequencies. Appendix 6-A of this section discusses this possible effect of the SOKC in more detail, along with other potential SOKC effects...

CHANGES TO THE NUREG

6. Revised discussion on the process of truncating and subsequently determining the importance of the SOKC.
 - *From page 83:* ... If the frequencies of the MCSs are calculated using a point estimate that does not account for the SOKC, and the point estimate frequencies of some of the MCSs containing correlated basic events are smaller than this truncation value, a subset of these MCSs may be incorrectly discarded because the correlated frequency (that accounts for the SOKC) of each MCS in this subset is actually larger than this truncation value...

CHANGES TO THE NUREG

7. The term “reasonable” was replaced with “credible.” The discussion was amended with the following paragraph. No impact was identified on Stage F.
 - *From page 99:* ...Section 4.3.1 of EPRI report 1016737 [EPRI, 2008] and Section 4.4.1 of EPRI 1026511 [EPRI, 2012] provide guidance on determining a reasonable range over which a sensitivity analysis should investigate model uncertainty.

STATUS AND NEXT STEPS

- ❑ NRR and NRO are being provided with the two-week notification of impending publication of the draft NUREG for public review and comment
- ❑ Will address NRR and NRO comments simultaneously with public comments
- ❑ Revision 1 to NUREG-1855 is scheduled for publication in early 2013