



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, DC 20555 - 0001**

June 3, 2016

MEMORANDUM TO:   ACRS Members

FROM:               Maitri Banerjee, Senior Staff Engineer **/RA/**  
                          Technical Support Branch  
                          Advisory Committee on Reactor Safeguards

SUBJECT:            CERTIFICATION OF THE MINUTES OF THE ACRS METALLURGY  
                          AND REACTORS FUELS SUBCOMMITTEE ON MARCH 22, 2016

The minutes for the subject meeting were certified on June 1, 2016. Along with the transcripts and presentation materials, this is the official record of the proceedings of that meeting. A copy of the certified minutes is attached.

Attachment: As stated

cc with Attachment: A. Valentine  
                              M. Banks



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, DC 20555 - 0001**

MEMORANDUM TO: Maitri Banerjee, Senior Staff Engineer  
Technical Support Branch  
Advisory Committee on Reactor Safeguards

FROM: Ronald Ballinger, Chairman  
Metallurgy & Reactor Fuel Subcommittee  
Advisory Committee on Reactor Safeguards

SUBJECT: CERTIFIED MINUTES OF THE ACRS METALLURGY AND  
REACTOR FUELS SUBCOMMITTEE MEETING ON  
MARCH 22, 2016

I hereby certify, to the best of my knowledge and belief, that the minutes of the subject meeting on March 22, 2016, are an accurate record of the proceedings for that meeting.

**/RA/**

**June 1, 2016**

---

Ronald Ballinger, Chairman  
Metallurgy & Reactor Fuel  
Subcommittee

Dated

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
MINUTES OF THE METALLURGY & REACTOR FUELS SUBCOMMITTEE  
MEETING ON RG 1.229  
MARCH 22, 2016, ROCKVILLE, MD

The ACRS Metallurgy & Reactor Fuels Subcommittee held a meeting on March 22, 2016 in T2B1, 11545 Rockville Pike, Rockville, Maryland. The meeting convened at 8:30 a.m. and adjourned at 11:24 a.m.

The meeting was open to the public.

No written comments or requests for time to make oral statements were received from members of the public related to this meeting.

ATTENDEES

ACRS Members/Staff

R. Ballinger, Chairman  
D. Bley, Member  
J. Rempe, member  
D. Skillman, Member  
D. Powers, Member  
M. Corradini, Member\*  
J. Stetkar, Member  
M. Banerjee, ACRS Staff (DFO)

NRC Staff and Consultants

C.J. Fong, NRR	Steven Lauer, NRR
Joseph Giitter, NRR	Stephen Smith, NRR
Jessica Kratchman, NRR	Mary Drouin, RES
Donald Harrison, NRO	Justin Fuller, OCM
Ashley Smith, NRR	Antonio Gomez, NRR
Bob Hardies, NRR	Rob Tregoning, RES
Mehdi Reisi-Fard, NRR	

## Other Attendees

Larry Naron, Exelon	Wayne Harrison, STPNOC
Stephen Geier, NEI	Steven Blossom, STP
Ernie Key, Public Participant*	Phil Grissom, SNC

\*Connected via telephone

## SUMMARY

The purpose of the meeting was to review the draft Regulatory Guide 1.229, "Risk-Informed Approach for Addressing the Effects of Debris on Post-Accident Long-term Core Cooling" (RG 1.229). The meeting transcripts are attached and contain a description of each matter discussed during the meeting. The presentation slides and handouts used during the meeting are attached to these transcripts.

The following list describes significant issues discussed during the meeting with the corresponding pages in the transcript referenced.

SIGNIFICANT ISSUES	
Issue	Reference Pages in Transcript
Chairman Ballinger started the meeting introducing the ACRS members present. After noting that the purpose of the meeting was to discuss RG 1.229 and prior ACRS briefings on the subject, he invited Joe Giitter, NRR, to introduce the staff presenters and start the briefing.	4-5
Mr. Giitter noted that more realistic methods, which appeared in an earlier version of the draft RG were not included in the current version due to ongoing work on resolving issues with the more realistic approach. The work is expected to be completed by the end of the year. In the meantime, the current version of the RG, based on tried-and-true methods that have been demonstrated to be effective in applications, will be available for use. Member Powers asked the staff to elaborate of the words "demonstrated to be effective," given that demonstration under realistic conditions was not a part of the current version of the RG. A long discussion followed. The staff mentioned the pilot program and that RG 1.229 builds upon the existing RGs.	5-10
Member Rempe asked about the treatment of the containment accident pressure in the RG. The staff noted that RG 1.82 would continue to apply	10-11

unless a plant has an exception that authorized credit for containment accident pressure in their licensing basis.	
To define the scope of staff presentation, Mr. Fong noted that they would highlight the differences between the RG that was discussed on November 4th of last year and the RG as it stands today. With an example of minor changes, Mr. Fong went into the discussion of substantial changes made to Appendix C of the RG. The bounding method for partitioning of LOCA frequencies was kept and the other two methods, a conservative partitioning method and a semi-quantitative partitioning method (increasingly realistic), were deleted. The bounding tends to produce the highest delta CDF. The staff continues to work on the other two methods. The members questioned the basis of staff's characterization of the final method remaining in the RG as "a little bit on the conservative side," given their experience with the pilot plant (STP) of somewhat unique design (may not be representing the fleet). The staff discussed an example of comments that made them exclude the other two methods. The staff expects to augment the RG with additional methods by the end of the year.	11-19
Discussion on the RG readiness for issuance and need for such issuance took place. The staff pointed out that 13- 14 non-pilots plan to use the bounding approach in the RG.	19-22
Mr. Fong presented the difference between the detailed approach for risk assessment of debris in Appendix A and the simplified approach in Appendix B. The App. A correlation of time versus head loss to drive the probability of these new basic events has been replaced in App. B with a conditional core damage probability of zero if the calculated debris falls below a threshold value. Upon member Stetkar's question a long discussion broke out on how uncertainties are handled in App. B, particularly the uncertainties related to the deterministic parameters involved and experiments done to validate. The staff's position was that conservativeness that comes with the use of RG1.82 would account for these uncertainties.	23-28
Staff presented their conclusions. Whether to change the base PRA to include those scenarios that are assigned to core damage (i.e., CCDF or CLRF of 1.0 in App. B) was asked by member Stetkar.	29-35
Member Powers asked if staff considered possible strategies to address uncertainties related to not knowing the unknowns. He noted the impact of radiation field to chemistry, although, its effect may be small. In response, staff mentioned the conservatism built into the process. Member Powers noted that risk-informed approach is the only way to address these kinds of concerns, and why a defense-in-depth strategy may not always address it.	35-41

Expanding upon member Stetkar's question on the need to change the base PRA, member Skillman asked if following RG 1.229 approach for a license amendment would land the licensee in configuration control challenges, among others. The staff stated that they did not intend the RG to address that; however, they would take a look at that question.	41-48
Member Stetkar noted that combinations of systems/trains assumed to operate would affect debris transport to screens, and hence the risk number. A long discussion took place on modifying the PRA to reflect the risk analysis done under App. A and App. B. Member Stetkar repeated his concern on lack of guidance in App. B regarding need to update the PRA with scenarios considered.	48-61
Chairman Ballinger had a question from member Corradini listening on the phone line regarding the BWR licensees' use of the RG. The staff noted that without a pilot it was difficult to address the issue for non-PWR plants and that they had not heard of a BWR licensee that wanted to use the RG approach.	61-66
Member Bley noted that the RG, specifically App. B, could benefit from addition of clarifications in the areas discussed above to prevent unnecessary RAIs from the staff reviewers.	66-67
Member Stetkar questioned the uncertainty in the threshold value in App. B, what he called "pass-fail" approach. He noted that parametric uncertainty within a consensus model needed to be considered to comply with the guidance in NUREG-1855. He cited amounts and types of debris, transport and deposition of the debris, and the effects of chemicals and particulates and fibers in that debris as examples. He noted that consideration of uncertainties in the risk-informed process can address concerns about the unknown unknowns. The staff pointed to the safety margins existing in the process and considered the approach to be reasonable.	67-75
A long discussion occurred upon member Stetkar's question about non-LOCA transients generating debris, and if the RG addressed that adequately including frequency screening. Discussion included effects of a seismic event outside a seismic-induced pipe break. The staff agreed to review the RG for need for additional clarity.	76-89
In his introductory remarks Steve Geier, NEI noted the need for efficient implementation of the RG without expenditure for substantial resources. Mr. Larry Naron, Exelon, delivered the industry presentation, and was asked by member Rempe to provide a BWR perspective. He noted the narrow (PWR only) scope of the RG, and had a few recommendations for improvements in areas that according to him may require significant interaction between the licensee and NRC staff to resolve (e.g., low	90-98

frequency LOCAs, periodic update, very qualitative threshold for reporting, introduction of cumulative conservatism by deterministic inputs). Regarding the last issue, Mr. Naron said that trying to refine the deterministic inputs would be cost-intensive.	
Mr. Harrison, STPNOC, provided an account of how the pilot plant started with the detailed approach and ended up with the simplified one. Their objective, as in the RG was to close the Generic Letter 2004-02. They do not consider this as a PRA calculation, but will add the process, model, and the assumptions that went into this evaluation into their updated final safety analysis report to reflect the licensing basis.	98-100
Member Skillman initiated a discussion on the reporting requirement. Mr. Harrison noted the qualitative criteria related to the reduction in defense in depth or safety margin were difficult to apply. However, the plants that are using the guidance found the RG to be overall useful and acceptable. Mr. Harrison expected dialogue similar to the ones between the ACRS members and the staff to happen between the licensee and the staff in the implementation of the RG.	100-105
Member Corradini asked for industry view on staff's plan to issue the RG with impending work on App. C on two additional methods. It was reported that there were some other plants following on that need to refer to the RG. Mr. Geier noted that it would be worthwhile to put the RG out on the street now, and have the remaining addition to follow later this year.	106-108
Chairman Ballinger asked for public comments. Mr. Ernie Key on the telephone line provided additional comments on the use of initiating events in the process vs. basic events in the PRA, uncertainty quantification, and inclusion of the risk assessment in the PRA. He noted that even with a simplified approach the magnitude of the risk was on the order of $10^{-7}$ . In the more detailed approach it was even lower, $\sim 10^{-8}$ . Hence, with a typical PRA CDF of $10^{-5}$ , this was very, very small. Steve Blossom from South Texas noted that Mr. Kay was representing the industry.	108-111
Chairman Ballinger asked for comments from members. Noting the limited scope of the RG, i.e., the incremental risk from a break at a certain location causing debris, member Skillman asked the staff to expand upon the extent of applicability during the full committee presentation. Member Bley noted that the RG was cleaned up a lot since the subcommittee members reviewed it back in December. And also that the lack of specificity in the RG appendices would make staff's review process tougher. As staff worked on the alternative methods for Appendix C, he wanted them to revisit discussions members had back in December. Member Stetkar summarize his three major points:	111-117

<ol style="list-style-type: none"> <li>1) lack of clarity in terms of the expected scope of the assessments which would be performed</li> <li>2) the expectation for how the PRA or the information in the PRA be used to support the simplified analysis in Appendix B, and should that evaluation then become part of the PRA going forward as an assessment of the risk from debris</li> <li>3) how uncertainty is treated beyond that for LOCA frequency, i.e., in the so-called deterministic consensus methods</li> </ol> <p>Member Rempe encouraged the staff to add clarifications as they noted in discussions during the meeting. Also, if industry thinks it might help and the staff agrees, then they should issue the RG.</p> <p>Member Corradini mentioned the need for issuing the RG before completing the work on Appendix C. Regarding completeness, he reiterated member Power's question on (changes in) chemistry effects induced by radiation.</p>	
<p>A short deliberation took place regarding the need for a full committee meeting and an ACRS letter on RG 1.229. The staff agreed regarding need for an ACRS letter. Member Bley noted that at the FC meeting the staff can explain the timeliness of issuing the RG. Member Powers noted that use by additional licensees could guide the completion of the RG. The staff pointed out that several licensees are in the queue to use this (RG) method, and the staff expects to review several of the applications in calendar year 2016. Additionally, Commission's expectation, following the policy on the cumulative effects of regulation, guides the staff to release the RG for public use when the rule (50.46c) goes out.</p>	118-120
<p>Chairman Ballinger adjourned the meeting at 11:24 a.m.</p>	121

#### Documents provided to the Subcommittee

1. Draft Regulatory Guide 1.229 (draft was issued as DG-1322, dated April 2015), "Risk-informed Approach for Addressing the Effects of Debris on Post-Accident Long-term Core Cooling" (ADAMS Accession No. ML16062A016)
2. NRC resolution of public comments on RG (ML16062A016, ML16062A014)
3. Compare between RG 1.229, December 2015 and RG 1.229 March 2016 (after incorporation of public comments - ML16062A015)
4. Preliminary Draft Regulatory Guide 1.229, "Risk-Informed Approach for Addressing the Effects of Debris on Post-Accident Long-term Core Cooling," October 19, 2015 (ML15292A012)
5. Preliminary Draft – "DRAFT Appendix C – Partitioning Plant-Wide LOCA Frequency," October 19, 2015 (ML15292A010)
6. NRC, "Staff Requirements – SECY-12-0093 – Closure Options for Generic Safety Issue 191, Assessment of Debris Accumulation on Pressurized-Water Reactor Sump



- Performance.” Washington, DC, December, 14, 2012 (ML12349A378).
7. NRC, “Staff Requirements – SECY-12-0034 – Proposed Rulemaking - 10 CFR 50.46c: Emergency Core Cooling System Performance during Loss-of-Coolant Accidents (RIN 3150-AH42).” Washington, DC, January, 7, 2013 (ML13007A478).
  8. ACRS letter “Draft Final Rule to Risk-Inform 10 CFR 50.46, ‘Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Reactors’,” November 16, 2006 (ML063190465)
  9. Regulatory Guide (RG) 1.174, Rev. 2, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis,” May 2011 (ML100910006)
  10. RG 1.82, Rev. 4, “Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident,” March 2012 (ML111330278)

# **Official Transcript of Proceedings**

## **NUCLEAR REGULATORY COMMISSION**

Title:                   Advisory Committee on Reactor Safeguards  
                              Metallurgy and Reactor Fuels Subcommittee

Docket Number:     (n/a)

Location:             Rockville, Maryland

Date:                  Tuesday, March 22, 2016

Work Order No.:     NRC-2248

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

+ + + + +

METALLURGY AND REACTOR FUELS SUBCOMMITTEE

+ + + + +

TUESDAY

MARCH 22, 2016

+ + + + +

ROCKVILLE, MARYLAND

+ + + + +

The Subcommittee met at the Nuclear  
Regulatory Commission, Two White Flint North, Room  
T2B1, 11545 Rockville Pike, at 8:31 a.m., Ronald G.  
Ballinger, Chairman, presiding.

COMMITTEE MEMBERS:

RONALD G. BALLINGER, Chairman

DENNIS C. BLEY, Member

MICHAEL CORRADINI, Member\*

DANA A. POWERS, Member

JOY REMPE, Member

GORDON R. SKILLMAN, Member

JOHN W. STETKAR, Member

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## DESIGNATED FEDERAL OFFICIAL:

MAITRI BANERJEE

## ALSO PRESENT:

STEVEN BLOSSOM, STP

C.J. FONG, NRR

STEPHEN GEIER, NEI

JOSEPH GIITTER, NRR

DONALD HARRISON, NRO

WAYNE HARRISON, STPNOC

ERNIE KEY, Public Participant\*

JESSICA KRATCHMAN, NRR

STEVEN LAUER, NRR

LARRY NARON, Exelon

STEPHEN SMITH, NRR

\*Present via telephone

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

8:31 a.m.

CHAIRMAN BALLINGER: This is a meeting of the Metallurgy and Reactor Fuels Subcommittee of the Advisory Committee on Reactor Safeguards. I'm Ron Ballinger, Chairman of the Metallurgy and Reactor Fuels Subcommittee.

ACRS members in attendance are Dick Skillman, Dana Powers, Dennis Bley, John Stetkar, and the inestimable Joy Rempe, who is conflicted to some extent. You're going to announce it? Not on this one? Okay. Ms. Maitri Banerjee is the Designated Federal Official for this meeting.

Today, we have members of the NRC staff to brief the subcommittee on their development and finalization of Regulatory Guidance 1.229, its final finalization, a risk-informed approach for addressing the effects of debris on post-accident long-term core cooling.

During our November 3rd, 2015 meeting, we received a briefing on the subject as it related to the proposed 10 CFR 50.46c rulemaking. The staff has incorporated comments from the public nuclear industry and NRC offices, and it's getting ready to finalize and issue the regulatory

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1 guidance. We also have Mr. Larry Naron  
2 representing NEI to provide us with the industry  
3 view on the subject regulatory guide.

4 The rules for participation in today's  
5 meeting were announced in the Federal Register on  
6 March 8th, 2016. The meeting was announced as an  
7 open-to-public meeting. No requests for making a  
8 statement to the subcommittee has been received  
9 from the public.

10 We have one bridgeline established.  
11 Oh, and I should say that I believe that Mike  
12 Corradini is on the line or will be -- he is on the  
13 line. Okay. To minimize disturbance, the public  
14 line will be kept in a listen-only mode. The  
15 public will have the opportunity to make a  
16 statement or provide comments at designated times  
17 toward the end of this meeting.

18 I now invite Joe Giitter, Director of  
19 NRR Division of Risk Management, to introduce the  
20 presenters and start the briefing.

21 MR. GIITTER: Thank you. Yes, I am Joe  
22 Giitter, the Director of the Division of Risk  
23 Assessment in NRR. This morning, you will hear a  
24 presentation from the staff on a regulatory guide  
25 that supports a risk-informed approach for

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1 addressing the effects of debris on post-accident  
2 long-term core cooling. The staff has worked hard  
3 and long to develop this regulatory guide, and we  
4 believe it is ready for use by licensees who  
5 utilize a risk-informed approach to address a GSI-  
6 191.

7 Ideally, this draft reg guide would  
8 have included more realistic methods, which  
9 appeared in an earlier version of the draft reg  
10 guide. The Office of Research and NRR have formed  
11 a working group which is tasked with resolving some  
12 of the issues that were raised with the more  
13 realistic approach. I'm hopeful that this working  
14 group will have completed its efforts by the end of  
15 the year. However, the current version of the reg  
16 guide is available for use now and is based on  
17 tried-and-true methods that have been demonstrated  
18 to be effective in applications.

19 We are hopeful that you will endorse  
20 the use of this reg guide as part of the regulatory  
21 guidance supporting the 50.46c rule. I appreciate  
22 the effort of the ACRS.

23 I will now turn the meeting over to  
24 C.J. Fong, Steve Laur, and Stephen Smith of the  
25 staff who will go into more detail on the draft reg

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1 guide. And I did want to point out before we do  
2 that, on my left is Jessica Kratchman, who is the  
3 50.46c project manager. Thanks. C.J.?

4 MEMBER POWERS: Before Mr. Fong gets  
5 started, I just had a question. You emphasized in  
6 your description that the methods are available for  
7 use and that they have, and I highlight the word  
8 demonstrated, to be effective. I wonder if you can  
9 explain that because it seems to me the most  
10 striking feature of this whole reg guide is that it  
11 has not been demonstrated under realistic  
12 conditions to be effective.

13 MR. GIITTER: That statement, for  
14 example, the reg guide borrows from other proven  
15 methods. So an example is, and C.J. will go into  
16 more detail on this, but it's based, in part, on  
17 Reg Guide 1.174; Reg Guide 1.82, which deals with  
18 head loss; NUREG-1855, which deals with  
19 uncertainties. All of those methods have been  
20 incorporated into the method in this draft reg  
21 guide.

22 MEMBER POWERS: Well, I mean, that's  
23 all well and good, but the real question is  
24 demonstrated strikes me as one of the, if I'm  
25 looking for a flaw in this whole thing is nothing

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1 has been demonstrated on anything that is what you  
2 would call prototypic conditions.

3 MR. FONG: We'll get into that. That's  
4 a fair question. I have a couple of slides that  
5 can talk about that, Dr. Powers.

6 MEMBER POWERS: It seems to me that, at  
7 this stage, we need to sit down to look at this in  
8 the terms of what can possibly go wrong here? You  
9 know, what are we leaving out and things like that,  
10 and I'll try to bring up one or two things that  
11 came to mind.

12 MR. FONG: Dr. Powers, again, I think  
13 we'll certainly get into that, but I would say one  
14 other thing, in addition to Joe's comments, we do  
15 have a pilot that we've been working on for quite  
16 some time. Like any reg guide, the first time it's  
17 rolled out, it's hard to say that it's been 100-  
18 percent demonstrated because there's a first time  
19 for everything. But I am confident that the reg  
20 guide is usable based on the staff's insights  
21 gained from the pilot review.

22 MEMBER POWERS: I guess I have a great  
23 deal of confidence that people can use the reg  
24 guide, a great deal of confidence in that. What I  
25 am concerned about is that when, in fact, we have

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1 to check and see if these analyses have, in fact,  
2 resulted in a system that's function, that it is,  
3 indeed, functional.

4 MR. LAUR: If I could just build on  
5 what C.J. and Joe said, maybe it was stated too  
6 strongly. This reg guide builds upon existing reg  
7 guides. Obviously, there's new material in it. In  
8 other words, how you apply the risk-informed  
9 approach to this specific application. But I think  
10 what Joe was trying to say is that the Reg Guide  
11 1.174 gives us a framework for risk-informed  
12 changes to the licensing basis and the other reg  
13 guides give us ways of calculating the  
14 deterministic aspects.

15 This particular reg guide doesn't  
16 conflict with those. It enhances those. And to  
17 the extent practicable and or practical or one of  
18 those words, it enhances places that don't have  
19 enough detail for this particular application.

20 The one thing that, I guess, prompted  
21 me to turn the mike on is this is the risk-informed  
22 process, so we have not only the risk insights but  
23 also the safety margins and defense-in-depth  
24 aspects. And that's one where Reg Guide 1.174 has  
25 seven very general things to consider. We try to

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1 provide more specificity here. Their thing is it  
2 has performance measurement as the fifth key  
3 principle in Reg Guide 1.174, and here we say it's  
4 necessary to monitor after this change is made and  
5 ongoing to make sure there aren't unintended  
6 consequences and that the consequences we hope to  
7 get, the intended consequences, are achieved.

8 MEMBER REMPE: So I was looking at the  
9 reg guide and, again, perhaps this got discussed  
10 because some of this started before I even joined  
11 ACRS. But I was a little puzzled about how  
12 containment accident pressure is treated in this  
13 reg guide versus 1.82. Was there some agreement  
14 made that it's allowed now in this reg guide where  
15 I thought 1.82 basically didn't, it discouraged the  
16 use of it.

17 And so could you talk about that?  
18 Maybe you've already planned it in your slides,  
19 although I didn't see it brought up in the slides  
20 when I looked at them. But can someone refresh my  
21 memory on it?

22 MR. SMITH: So the intention would be  
23 that Reg Guide 1.82 would continue to be applied  
24 when this reg guide is being, you know, when this  
25 reg guide is being implemented. Some plants have

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1 can credit containment accident pressurce, so if  
2 it's already in their licensing basis we wouldn't  
3 take that out.

4 MEMBER REMPE: But if it's not, you're  
5 not going to let them use it?

6 MR. SMITH: If it's not, they would  
7 have to justify or they would have to get a  
8 license, it would have to be part of their license  
9 amendment request to allow the use of containment  
10 accident pressure for --

11 MEMBER REMPE: Okay.

12 MR. FONG: Okay. I'm going to suggest  
13 that we start the slides, and we can continue the  
14 dialogue as we go. All right. So we have three  
15 objectives. The first is to provide a status of  
16 the reg guide and let you guys know where we are.  
17 Second, I'm going to highlight some changes that  
18 have taken place since the last time we spoke in  
19 front of this subcommittee. There have been a few  
20 discussions in front of the full committee on the  
21 reg guide and also the rule itself, but we're going  
22 to highlight the deltas between the reg guide that  
23 was discussed on November 4th of last year and the  
24 reg guide as it stands today.

25 We've seen some questions from various

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1 stakeholders on the difference between the so-  
2 called detailed approach that's in Appendix A and  
3 the simplified approach in Appendix B. So we're  
4 going to discuss that a little bit and hopefully  
5 clarify the difference between those two  
6 approaches.

7 So where are we today? Well, when we  
8 last spoke in front of the subcommittee, Reg Guide  
9 1.229 was still in the internal concurrence  
10 process, and there were still a variety of changes  
11 that either were made, you know, around the time of  
12 the meeting and subsequent to the meeting. And so  
13 I wanted to highlight a big difference where we are  
14 today versus where we were back in November.

15 Today, the reg guide has completed the  
16 concurrence process, has received a finding of no  
17 legal objection from the Office of General Counsel,  
18 has stabilized. As you see here, the concurrence  
19 was achieved on February 8th. No changes since  
20 then, so the version that was sent to the ACRS  
21 Subcommittee a little over 30 days prior to this  
22 meeting, that's it, that's the version.

23 Obviously, changes can still occur. If  
24 the Commission tweaks the rule or, you know, other  
25 changes are necessary, we certainly can do that.

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1 But I want to be very clear that this is not a reg  
2 guide that started in flux or that there's a bunch  
3 of ongoing changes. This is, we believe this is  
4 our best shot. We believe this reg guide is ready  
5 for use, and this is a stable and usable version.

6 To highlight a couple of the changes, I  
7 first wanted to mention that there was a minor  
8 change to the reg guide necessitated by a change to  
9 the rule itself. And this was discussed, just to  
10 refresh your memory, Mr. Chairman, back in the  
11 February 4th full ACRS meeting. And then we  
12 changed the rule language a little bit to clarify  
13 that not every single change to the analysis would  
14 require a licensee to come back to the NRC staff  
15 with a LAR. The rule, as originally written, could  
16 be interpreted that way, and we wanted to clarify  
17 that, certainly while some changes, particularly a  
18 significant change to a method, switching to a  
19 seismic PRA from a margins analysis, changing, you  
20 know, drastically changing the LOCA frequencies  
21 that were allocated, something like that, would  
22 require a change. But minor changes we felt the  
23 licensee should handle. So the rule language  
24 itself was clarified in Part E.3, and we made a  
25 simple conforming change to the reg guide to

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1 reflect that reality.

2 The more substantive changes that have  
3 taken place since November of last year are really  
4 found in Appendix C. And if you think back to  
5 November, Appendix C originally had three methods  
6 for partitioning a plant-wide LOCA frequency on  
7 individual occasions, and this is something that  
8 has been discussed quite a bit in the last several  
9 meetings. But just as a reminder, originally we  
10 had three methods of so-called bounding approach,  
11 what we called a conservative partitioning, and a  
12 semi-quantitative partitioning. And so those kind  
13 of go in order of realism, in a sense. The  
14 bounding tends to produce the highest delta CDF  
15 results, conservative partitioning is kind of in  
16 the middle, and, in method three, semi-quantitative  
17 partitioning tends to produce lower results.

18 As we went through the internal  
19 concurrence process, we really had a tough time  
20 getting full alignment on methods two and three.  
21 And so we made a decision that we would move the  
22 reg guide forward only retaining method one.  
23 Although it's a little conservative, we thought it  
24 was usable based on information we received from  
25 the pilot, and the decision was made, as Joe

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1 mentioned, to continue to work on methods two and  
2 three.

3 MEMBER STETKAR: So because you  
4 received information from South Texas, which looks  
5 like no other plant in the country, then only the  
6 conservative method applies for every other plant  
7 in the country?

8 MR. FONG: Well, I'd point out, Mr.  
9 Stetkar, it's a reg guide, so licensees are free to  
10 come forward with alternate methods if they see  
11 fit. We felt that only method one was ready for  
12 prime time at this point, and we're going to  
13 continue on our own working on methods two and  
14 three. But, of course, licensees, if they feel  
15 that method one doesn't suit their needs, they're  
16 welcome to propose other methods, as well.

17 CHAIRMAN BALLINGER: I just got an  
18 email from Mike Corradini. He'd like to ask a  
19 question. He said he's on mute.

20 MEMBER CORRADINI: Can you hear me?

21 CHAIRMAN BALLINGER: Yes, hear you  
22 fine.

23 MEMBER CORRADINI: Okay. All right.  
24 So my question is following up Mr. Stetkar's  
25 question. My feeling is, unless I misunderstand

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1 Appendix C, that the staff is going to have to go  
2 in with a number of individual case-by-case  
3 exceptions to the Appendix C guidance because it  
4 doesn't seem to follow what I remember to be what  
5 you use, I guess, assume is the pilot. Am I  
6 misunderstanding?

7 MR. FONG: Well, Dr. Corradini, I don't  
8 think the staff needs to start doing a bunch of  
9 one-offs. We feel that method one, again, while it  
10 tends to be a little on the conservative side, is a  
11 usable method that licensees can use right now.  
12 It's simplified.

13 MEMBER STETKAR: My point, C.J., is you  
14 use the term here on the record a little bit on the  
15 conservative side. My question is what basis do  
16 you have for a little bit on the conservative side?  
17 Because you only have one partial analysis for one  
18 plant that doesn't look like any other plant in the  
19 country in terms of their conditional core damage  
20 frequency, the number of trains of equipment they  
21 have, and so forth and so forth and so forth. So  
22 why do you know that it's a little bit conservative  
23 for everybody else in the country who might use  
24 this?

25 MR. FONG: Right. So there's two

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1 things that we've done.

2 MEMBER STETKAR: It might be a lot, a  
3 lot, a lot conservative, and I'll take that  
4 approach.

5 MR. FONG: It's going to depend on the  
6 plant absolutely.

7 MEMBER STETKAR: Okay. Well, then why  
8 don't you allow other plants in the regulatory  
9 guidance to use more realistic approaches that the  
10 staff has thought through, without going into, as  
11 Mike said, this sort of one-off, everybody gets a  
12 separate evaluation because everybody needs to use  
13 some little trick that --

14 MR. GIITTER: Dr. Stetkar, let me try  
15 to speak to that. I think the staff intended to  
16 include all three methods in the reg guide. And in  
17 the concurrence process, we were unable to get  
18 concurrence from one of the offices involved in  
19 reviewing it. And an assessment was made based on  
20 the extent of the comments that it would be more  
21 expedient for us to move forward with the one more  
22 conservative method and continue to work on  
23 refining and addressing the comments on the  
24 remaining two methods.

25 MEMBER STETKAR: Well, could you -- I,

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1       unfortunately, wasn't at the subcommittee meeting  
2       last fall where I understand this was discussed at  
3       some depth. What type of comments and concerns did  
4       you get on those other two methods in the former  
5       version of Appendix C? What were the concerns?

6               MR. FONG:     Sure.     I'll give you an  
7       example. So the kind of overarching comment we got  
8       was that methods two and three have merit, but  
9       they're not quite ready for regulatory use. And so  
10      here's one example.     Method three leverages  
11      information from risk-informed ISI, and it assigns  
12      a high, medium, or low relative magnitude for each  
13      location based on ISI insights. And what some  
14      folks pointed out was that risk-informed ISI  
15      doesn't include all the plant locations that are  
16      important to a GSI-191 analysis. For example, if  
17      you have a program, those locations are scoped into  
18      that specialized program and aren't looked at in  
19      risk-informed ISI space or aren't assigned a high,  
20      medium, and low. So there's a couple of gaps --

21              MEMBER STETKAR:   But if I was a plant,  
22      couldn't I go out and look at those locations and  
23      do that assignment?

24              MR. FONG:   That's what we do, sure.

25              MEMBER STETKAR:   Well, okay.

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1 MR. FONG: So that was the point that  
2 the whole method, it's not that the method is  
3 invalid. We just had some details that needed to  
4 be filled in before the method could totally be  
5 used, and that's what we're working on right now.

6 MEMBER STETKAR: Go on, Mike.

7 MEMBER CORRADINI: I'm sorry, I'm  
8 sorry. But then the intent is that this is, that  
9 the Appendix C is a living document, that we're  
10 going to see additions to it?

11 MR. FONG: I wouldn't call it a living  
12 document. I would call it a -- right now, it's the  
13 best available method that we have, and we're going  
14 to augment it with, hopefully, at least one or two  
15 additional methods by the end of the year.

16 MEMBER CORRADINI: Okay. Then the  
17 timing of doing it now versus doing it in a year is  
18 what? Why push forward now if you're not ready?

19 MR. LAUR: This is Steve Laur. There's  
20 a couple of things here. One is it looks like, you  
21 know, schedule pressure because it's tied to  
22 50.46(c) rulemaking. But in actual fact, there's a  
23 lot of good information in this regulatory guide  
24 beyond just how -- this is obviously a key part --  
25 but beyond just what's in Appendix C. There's all

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1 the parts about the monitoring program, the  
2 defense-in-depth, how you evaluate that, how you do  
3 the head loss, debris transport, etcetera. All  
4 that is in there, and most of that has been based  
5 on an experience from a pilot program.

6 So, you know, we can hold off until we  
7 have a perfect Appendix C with technically  
8 justifiable methods, which is what we're really  
9 lacking now, in my opinion, is the technical basis  
10 for methods two and three. It turned out to be not  
11 an easy fix but a little more thorny problem, so  
12 we're hoping with this working group between  
13 research and our office to have something for a  
14 revision to this reg guide hopefully, as Joe said,  
15 by the end of the year. But to hold the entire reg  
16 guide with all the other guidance in advance until  
17 then didn't seem to be the proper thing to us.

18 MEMBER CORRADINI: So just to clarify,  
19 so you are going to look for a change, so that  
20 means certain licensees are going to use this in  
21 this interim time period of the next nine months  
22 that they need to see this and get started?

23 MR. FONG: Yes. And just to be clear,  
24 we have only one docketed submittal right now,  
25 which is the South Texas project you'll hear from a

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1 little bit later. We do have preliminary  
2 information from public meetings and other sources  
3 on some of the first non-pilot plants, and so this  
4 was not done in a vacuum just to look at one  
5 licensee. We took all the information we had that  
6 was available to us at the time when we made the  
7 decision to move forward with just method one.

8 MEMBER CORRADINI: Okay, all right.  
9 What strikes me is, I think it goes back to Dr.  
10 Powers' point that there's a pilot that's in  
11 process. And unless I misunderstand -- and there's  
12 a lot of good stuff in the reg guide. But as I  
13 understand, it's fashioned basically with that  
14 knowledge of that pilot, which is yet to be  
15 finished. So I'm still struggling to understand  
16 the need to push forward at this point since some  
17 of these things seem, John uses a bit conservative,  
18 I can't tell, but it's one pilot that hasn't been  
19 completed.

20 So I'll stop. Thank you. And I'll go  
21 back on mute.

22 MR. D. HARRISON: This is Donnie  
23 Harrison from the staff. I would just point out,  
24 and pardon me if I'm wrong, C.J. and one of the  
25 Steves, but the non-pilot plants are more aligned

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1 with the simplified bounding approach. So that's,  
2 so it's not that that approach was developed for  
3 the South Texas pilot. It's actually kind of a  
4 reverse. It's actually the approach that the 13 -  
5 14 non-pilots plan to use, and then we're  
6 conforming South Texas to it at this point.

7 MR. FONG: Okay. We talked about some  
8 of this already, but the path forward on Appendix  
9 C. Again, we believe that the current reg guide is  
10 ready to be used, and the bounding method that  
11 we've talked about is suitable for the pilot. Of  
12 course, we're going to evaluate experience as we go  
13 and complete the pilot, and we'll revise the reg  
14 guide as necessary. And, as Joe mentioned and we  
15 talked about before, we're currently working on  
16 some additional methods to go into a revised  
17 version of Appendix C.

18 Just some detail on what that looks  
19 like. We had a meeting between NRR and research  
20 back in February and an agreement to augment  
21 Appendix C with more realistic methods. So we have  
22 a written project plan on how to do that. We've  
23 identified the key staff that will be working on  
24 that effort. They've put together a series of  
25 milestones and key actions that need to take place.

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1 And as Joe mentioned, we're going to attempt to  
2 complete that by the end of the year or possibly  
3 early next year.

4 Now I'd like to shift gears a little  
5 bit and talk about the difference between the  
6 detailed approach in Appendix A and the simplified  
7 approach in Appendix B. Appendix A, the detailed  
8 method, what you're going to see is different basic  
9 events that are added to the PRA model. For  
10 example, a basic event for strainer failure, loss  
11 of NPSH of the strainer, and a basic event for core  
12 blockage. And you'll see a variety of models that  
13 are used to estimate a failure probability for  
14 those basic events based on what happens on the  
15 debris generation and transport phase, and you'll  
16 see a probability that's assigned based on a  
17 variety of different conditions.

18 And so I think a key element to that  
19 approach, if you're looking for a delta between the  
20 two, is that in Appendix A you're going to see a  
21 correlation of time versus head loss, correlation  
22 that's used to derive the probability of these new  
23 basic events; whereas in the simplified approach in  
24 Appendix B, what you're going to see is what I call  
25 go-no-go test, so there's going to be a comparison

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1 of the degree, for example, at the strainer  
2 compared with an existing test data. And you'll  
3 see a conditional core damage probability of zero  
4 if the debris that's calculated, its generating  
5 transport, is below that threshold or 1.0 if that  
6 degree amount is above the threshold.

7 So you don't have a time versus head  
8 loss. You don't have a probability. Just go-no-go  
9 for each break scenario.

10 MEMBER STETKAR: C.J., I have a lot of  
11 questions on the reg guide. You guys don't have a  
12 lot to present here. Okay. You're apparently done  
13 with this, so I can ask all my questions. You  
14 mentioned Appendix B says go-no-go. That implies  
15 that if something, if go means I have less than  
16 2.77736 and I calculate that I have 2.7735, I pass;  
17 if I have 2.7737, I fail, whatever that is.

18 How do I account for uncertainties in  
19 all of this? Now, you very clearly say that  
20 whenever I calculate LOCA frequencies, I have to  
21 account for uncertainty. How do I account for all  
22 of the other uncertainties when I do this  
23 simplified approach, like uncertainties in the  
24 amount and types of debris, uncertainties in the  
25 transport, uncertainties in actually what will

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1 plug? Because everything else is as, if the  
2 wonderful deterministic folks know what those  
3 numbers are after those six significant figures or  
4 whatever I babbled, so how do I account for all of  
5 those other uncertainties?

6 MEMBER POWERS: Yes, that is not the  
7 problem.

8 MEMBER STETKAR: That is not the  
9 problem?

10 MEMBER POWERS: The deterministic guys  
11 may well know things out to significant figures.

12 MEMBER STETKAR: They think they know  
13 that.

14 MEMBER POWERS: What they don't know  
15 are the phenomena that appear under realistic  
16 conditions and at these simulated or not  
17 anticipated.

18 MEMBER STETKAR: I characterize all  
19 that as part of my uncertainty about whether I pass  
20 or fail.

21 MEMBER POWERS: The uncertainty is the  
22 issue. The really catastrophic uncertainty are  
23 those things that don't get simulated when we do  
24 experiments to validate the deterministic analysis.

25 MR. SMITH: The staff is aware that

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1       there is a significant amount of uncertainty in the  
2       calculations that are done strictly to determine  
3       how much debris gets to the strainer and how much  
4       head loss that that debris is going to cause. So  
5       we have a reg guide, Reg Guide 1.82, and it  
6       incorporates a lot of things through reference, but  
7       our conclusion when we developed that reg guide was  
8       that it was significantly conservative to make up  
9       for a lot of these uncertainties.

10               So that is, that is the way that we  
11       deal with those types of uncertainties, not the  
12       break frequency uncertainty. These plants that are  
13       using the simplified approach are following the Reg  
14       Guide 1.82 guidance, and this is the same guidance  
15       that we apply to plants that are not using a risk-  
16       informed resolution. And we believe that those  
17       plants are, you know, they're dealing with --

18               MEMBER STETKAR: We believe that plants  
19       were safe from fires because everybody followed or  
20       thought they were following Appendix R. We found  
21       in risk assessments that isn't true when people  
22       look at more things more thoroughly and account for  
23       uncertainties. So I guess I'm challenging the  
24       staff about how this whole process accounts for  
25       uncertainty. Just simply saying that, well, you

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1 have to account for uncertainty in the LOCA  
2 frequency because I can look up in a table in  
3 NUREG-1829 -- and those folks have to own those  
4 uncertainty distributions. You don't. Nobody else  
5 does. They're there for me, so I've got them. I  
6 don't get it.

7 MR. SMITH: The way that we're  
8 combining the two aspects of this --

9 MEMBER STETKAR: You're presuming --

10 MR. SMITH: -- resolution --

11 MEMBER STETKAR: -- that a point  
12 estimate for debris generation, debris transport,  
13 debris accumulation on the strainers, chemical  
14 effects, strainer pass-through, debris accumulation  
15 on the core, you're presuming that all of that  
16 stuff is somehow conservatively bounding without  
17 ever having assessed the uncertainties.

18 MR. SMITH: That's correct.

19 MEMBER STETKAR: Okay, thank you.

20 MR. SMITH: And I think that that's,  
21 you know, we've been in front of this committee  
22 with our deterministic resolutions, and I believe  
23 that it's been accepted by the committee, you know,  
24 the methodology that we use. And I think the way  
25 that we're combining the deterministic methodology

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1 with the risk-informed methodology is just building  
2 on, you know, previously-accepted methods, and I  
3 don't see that we've left a gap in there where we  
4 don't treat uncertainty.

5 MEMBER STETKAR: I didn't do this last  
6 week. I'll do it during the break. I'll do a word  
7 search on Reg Guide 1.82 and see if the word  
8 "uncertainty" pops up in there anywhere. I'm not  
9 sure whether it does or not.

10 MR. FONG: Do you want me to move  
11 forward, or do you have an additional question that  
12 you wanted to ask --

13 MEMBER STETKAR: I have a lot of  
14 questions on the reg guide, and, since your next  
15 slide says conclusions, I can either wait for you  
16 to finish that, if you'd prefer to do that. Why  
17 don't you do that?

18 MR. FONG: Sure. Just four  
19 conclusions. You've heard me state them a little  
20 bit earlier. We think the reg guide is ready to  
21 go, and it's completed the concurrence process.  
22 You've heard Joe talk about how it utilizes and  
23 relies on existing tried-and-true processes. And  
24 as I said earlier, we are working on developing  
25 some additional methods in Appendix C for one

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1 specific area, for LOCA frequency allocation. But  
2 as Steve Laur mentioned earlier, we think there's a  
3 lot of really good guidance in the reg guide that's  
4 ready to go. We didn't want to hold up all this  
5 other useful guidance just for this one step. And  
6 so we want to move the reg guide forward and get  
7 that guidance out to the industry where they can  
8 use it.

9 MEMBER STETKAR: I did my word search.  
10 The word "uncertainties" does crop up, so I can't  
11 say it doesn't. But I don't know how they're  
12 treated. Okay. If I do the simplified approach,  
13 according to Appendix B, and I conclude that the  
14 change in risk is acceptable, do I then need to  
15 change my base PRA to include those scenarios that  
16 I determine are assigned to core damage or, you  
17 know, assigned 1.0 conditional core damage  
18 probability or 1.0 conditional large early release  
19 frequency? Do I need to do that, yes or no?

20 MR. FONG: Well, we had a lengthy  
21 discussion, the staff had a lengthy discussion  
22 about meeting a base PRA. We believe the base PRA  
23 the as-built, as-operated plant represented  
24 realistically so --

25 MEMBER STETKAR: Good. That's my

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1 interpretation. So now that we agree on that term,  
2 do I need to change that thing?

3 MR. FONG: Yes. I think, at any given  
4 time, it's your best estimate, it's the licensee's  
5 and the NRC's best estimate of what's really going  
6 on at the plant.

7 MEMBER STETKAR: That's not clear to me  
8 in the guidance. I read through the guidance in  
9 several places, and it never told me that I need to  
10 go change my PRA after the submittal is accepted or  
11 approved, you know, so that those scenarios that  
12 were assigned to core damage or large early  
13 release, according to the simplified method, are  
14 not part of my PRA for the as-built, as-operated  
15 plant. I could read the guidance to say I don't  
16 need to do that. That's why I asked the question.

17 MR. FONG: Yes, I certainly understand  
18 the question. I think we were trying to be careful  
19 here because we wanted to write a reg guide on how  
20 licensees calculate the portion of risk  
21 attributable to debris. There's guidance out there  
22 on what needs to be in your PRA for a given  
23 application, whether it's doing a significance  
24 determination process evaluation, a license  
25 amendment request. We want to be careful we let

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1       that guidance do what it needs to do.

2               For example, for what needs to be in a  
3       PRA, there's Reg Guide 1.200, and that's the PRA  
4       standard. We didn't want to try to cross over into  
5       that world. We wrote a reg guide specifically for  
6       this application.

7               MR. LAUR: Just to add to that, but I  
8       think a reading of the reg guide would lead you to  
9       believe or you should be able to infer from the reg  
10      guide or maybe it's explicit that the licensee has  
11      to maintain the risk-informed assessment of debris  
12      over time.

13              MEMBER STETKAR: Yes.

14              MR. LAUR: You're right it is mute on  
15      whether or not you have to update that into the PRA  
16      because I think where you're going with this is  
17      that this is going to be grossly conservative in  
18      most cases, it will be a lump that you add to the  
19      base PRA that would be useless. In most of your  
20      calculations, it would never show a delta, unless  
21      you did the Appendix A method where you actually  
22      have it in the model. But it is important that the  
23      licensee update this specific analysis, even if  
24      it's the simplified approach, periodically to  
25      ensure that they meet the acceptance criteria.

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1                   MEMBER STETKAR:   No, Steve.   What I'm  
2                   concerned about is that if they don't update their  
3                   PRA -- and I'll get away from this notion of base  
4                   versus whatever.   It's the PRA of the plant.   If  
5                   they choose to take this risk-informed approach and  
6                   say, well, we're going to do a simplified  
7                   conservative analysis of this particular issue, the  
8                   same way as I do a simplified conservative analysis  
9                   of a lot of other issues in the PRA, this just  
10                  happens to be one of them, if I do that then here  
11                  are the implications in my PRA today of doing that  
12                  analysis.   And some sequences in my PRA then get  
13                  assigned to core damage and perhaps direct large  
14                  early release.   Fine.   You know, I do that with a  
15                  lot of things in my PRA.

16                 If something comes up later that I then  
17                 need to use my PRA to address, whether that's a  
18                 risk-informed application for some other issue or  
19                 whether it's some sort of episodic event that I  
20                 need to use the PRA to argue with the staff about  
21                 what's the delta risk of this particular event or  
22                 whether it's significance -- whatever I'm going to  
23                 use my PRA for, ought not those sequences be in  
24                 that PRA?

25                 MR. LAUR:   Yes, I think C.J.'s answer

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1 was on point there.

2 MEMBER STETKAR: Okay. And as I said,  
3 it's not clear to me reading, there's a big long  
4 section of part of Section C.1D that says, well, if  
5 you're consistent with the rule, you can use the  
6 simplified approach and you got to go do these  
7 things. It leads me to believe that I don't need  
8 to do anything else --

9 MR. LAUR: Each other application has  
10 either Reg guide 1.174 and/or a specific reg guide  
11 for that application.

12 MEMBER STETKAR: Is the use of my PRA  
13 to answer a question about the significance  
14 determination process or answer a question about  
15 some episodic event that has happened in industry a  
16 risk-informed approach that applies under one of  
17 those other reg guides?

18 MR. FONG: Strictly speaking, no.

19 MEMBER STETKAR: Thank you.

20 MR. LAUR: But then, again, there's no  
21 requirement to update the PRA, unless you have --

22 MEMBER STETKAR: Yes, if I tried to use  
23 my PRA for one of those things and I didn't  
24 evaluate loss of off-site power, would you have a  
25 problem with that, even though there's no

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1 requirement that my PRA has to meet Reg Guide  
2 1.200?

3 MR. LAUR: Yes, I'd have a problem with  
4 that, but I'm failing to make the connection here.

5 MEMBER STETKAR: Your point is that my  
6 PRA ought to be my PRA. Some of the things in my  
7 PRA are more realistic, some of the things in my  
8 PRA are more conservative. But it's my PRA, and  
9 I've got to live with it, and I've got to live with  
10 it from this point forward, for whatever reason I  
11 want to use it, whether it's just discussions with  
12 the staff or whether it's an actual risk-informed  
13 application under some other regulatory guidance.

14 And as I said, as I read this  
15 regulatory guidance, I could come to the conclusion  
16 that all I have to do is some one-off calculation,  
17 say I'm fine, keep my PRA unchanged, and then four  
18 years later look at it and do the same one-off  
19 calculation and say I'm still fine.

20 MR. LAUR: Right. And if you never use  
21 the PRA for anything else, that would be acceptable  
22 for this application. I guess, in my opinion, this  
23 is not the reg guide where you would put that --

24 MR. FONG: That's what I was saying.  
25 There is guidance out there for the different ways

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1 in which PRA is used: changes to a licensing basis,  
2 looking at inspection findings, MSPI. And there's  
3 a lot of different applications for PRA, and  
4 there's application-specific guidance out there  
5 that's already in play. And so we didn't try to go  
6 out and re-write the rules for all those other  
7 applications. I don't think that would have been  
8 appropriate for us to do that here.

9 CHAIRMAN BALLINGER: Before we get to  
10 the next question from John, I've got an email from  
11 -- I'm trying to do parallel processing here --  
12 from Mike. He says, "Dana feels that they are  
13 missing a phenomena," with an exclamation mark, as  
14 he hinted what is missing, chemistry effects. So I  
15 guess it's a question for you. I'm just reading  
16 from the -- you know, what would you like me to do?  
17 He's listening. He may not be able to talk, but  
18 he's listening.

19 MEMBER POWERS: That's the best  
20 possible situation.

21 CHAIRMAN BALLINGER: He's fine. He's  
22 sending me emails back and forth here.

23 MEMBER POWERS: I'd be happy to point  
24 out lots of things they have not considered, but  
25 anything that gets considered, by definition, can

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1 get addressed. It's the things, it's the famous we  
2 don't know what we don't know kinds of things that  
3 bother me.

4 Now, when I say they have not tested  
5 under productivity conditions, for instance no  
6 radiation field. Does radiation field affect  
7 filtration performance and things like that? Yes,  
8 it turns alkenes into ketones, ketones can  
9 polymerize. So it can affect things. Now, is that  
10 going to be a huge effect? I don't know. If I  
11 were doing the deterministic analysis, I would say,  
12 you know, if I'm a staff member working, oh, it's  
13 probably a small effect. But I don't know, and you  
14 have to recognize that you don't know.

15 But those things, I can take account of  
16 those things. It's the things that I don't think  
17 of that we really need to worry about. And what  
18 I'm asking about is have we carefully considered  
19 how things can go agley, as they say here, in  
20 formulating this reg guide and thinking that it's  
21 somewhat conservative. Is it in fact, and could we  
22 design some strategy where we can validate this?  
23 That's very difficult.

24 I mean, I keep hoping for a plant in  
25 Iran to fail, but it's not going to have all the

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1 systems there and it's not going to be instrumented  
2 and there's just going to be one accident when it  
3 does. So it's less than a perfect test, and that  
4 will always be the case. I mean, that's one of the  
5 strongest motivations I can think of to go to a  
6 risk-informed kind of approach here is because you  
7 will never have perfect information on this system,  
8 even if it's incorporated in a plant and that plant  
9 undergoes an expected accident. That will still be  
10 one data point.

11 And so that's what I'm asking about is  
12 how big is that we don't know what we don't know  
13 portion of this pertinent to this particular reg  
14 guide and how do we cover ourselves on that?

15 MR. SMITH: I guess I can't disagree  
16 that we don't know what we don't know.

17 MEMBER POWERS: Yes. I mean, there's  
18 always going to be something, right?

19 MR. SMITH: I'm just going to kind of  
20 repeat what I said before. We have deterministic  
21 guidance, which is, you know, acceptable to the  
22 NRC, which we are using in this reg guide, and I  
23 think the way that we're using it, we haven't, we  
24 haven't eroded any of the conservatism that's built  
25 into that.

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1           So I don't really know, you know, other  
2           than going back and revising our deterministic  
3           guidance, taking another look at that, which we are  
4           always looking at that, you know. When we find out  
5           new things, we try to take those into  
6           consideration. I don't know what we would do, you  
7           know, within this reg guide to resolve that kind of  
8           issue.

9           But, you know, the people who evaluate  
10          this, we think we have a pretty good framework for  
11          doing the evaluation that has conservatism built  
12          into it, and we understand that there are unknowns.  
13          For example, you know, we've been through a lot of,  
14          we've looked at the chemical effects and radiation  
15          effects and things like that. Of course, we don't  
16          --

17                 MEMBER POWERS: I haven't really seen  
18          anybody look at the radiation effects in what I  
19          would call a systematic fashion. Again, if I were  
20          working for you and you asked me to look at that,  
21          I'd probably come back and tell you, well, it's  
22          probably a small effect. The grosser chemical  
23          effects, what I would call thermal chemical  
24          effects, we've kind of looked at and we don't  
25          really understand, but we've kind of looked at. We

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1 have, I hate to call it an intuitive feel, but we  
2 have something in an experimental feel for how  
3 weird it is. We have semblance that we're kind of  
4 comfortable with. You know, I would put it, if I  
5 were you, put in user needs that, God, if you ever  
6 find out anything more about what's in the sumps at  
7 Fukushima, for God's sake, tell me because, you  
8 know, that's the kind of prototypic data that you'd  
9 really like to know to know how good things are.

10 MR. FONG: I think one other important  
11 -- that's a great answer.

12 MEMBER POWERS: If you do have somebody  
13 that's looked systematically -- I mean, I won't  
14 worry about these chemical transformations that  
15 occur in radiation fields a lot, especially with  
16 organics. So if somebody has looked at that in a  
17 systematic fashion, I'd sure like to see it  
18 because, otherwise, I haven't.

19 CHAIRMAN BALLINGER: Are you arguing  
20 for a conservative approach to account for that?

21 MEMBER POWERS: Well, no. I think, as  
22 I've said explicitly, I think a risk-informed  
23 approach is the only way to address these kinds of  
24 concerns because you will never know what you don't  
25 know. Never. I mean, it's a tautology.

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1                   MR. FONG:   And one thing I wanted to  
2                   add, Dr. Powers, is, of course as you know, a key  
3                   part of the risk-informed approach is having a  
4                   defense-in-depth strategy. So if you look at what  
5                   the reg guide does, it has the licensees identify  
6                   what sequences are going to lead to core damage and  
7                   quantify those, but we don't stop there. We also,  
8                   to account for unknown unknowns, as Reg Guide 1.174  
9                   has us do, we have the licensees define a defense-  
10                  in-depth strategy that looks at what if we're wrong  
11                  and one of these scenarios happens.

12                 MEMBER POWERS:   Yes, it's, it would be  
13                  good if the licensee did exactly that, which is how  
14                  can this system fail? You know, what does it do to  
15                  cause this system not to work? But that's not what  
16                  they do when they do defense-in-depth. When they  
17                  come to that part of 1.174, they string together a  
18                  bunch of lists of things that bolster their  
19                  conservatism. I would be much more comfortable if  
20                  they would come in and say this thing all works  
21                  unless there's kryptonium in the solution and then  
22                  kryptonium screws it all up or something like that.

23                 I am reminded of once being in a  
24                  position of having to identify ways of preventing  
25                  refinement of radiated reactor fuel, and I spent a

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1 week with people that do that at Rocky Flats, and  
2 they assured me in no uncertain terms that their  
3 refinement techniques would work on any kind of  
4 fuel I would deliver to them of any sort. It went  
5 on at elaborate lengths. I thanked them very much,  
6 and, on the way out, the guy says, "Well, make sure  
7 you don't put any silicon in that fuel. Our  
8 columns can't tolerate salicylic acid." This is  
9 what I was looking for all the time. It's those  
10 things that surprise you, and you know, as well as  
11 I do, as soon as you get the surprise, oh, of  
12 course I knew that. So many times it happens.

13 MEMBER SKILLMAN: I'd like to jump in  
14 here for a second, and I want to build on John  
15 Stetkar's questions. The way this document, this  
16 reg guide is written, on page 17, an entity seeking  
17 to use this approach is required to submit an  
18 application. I spent a lot of time at sites, and  
19 when a site makes its mind up that it's going to  
20 make a major change and it's going to produce a  
21 license amendment, that is a big deal. It's also  
22 an expensive deal. It's time consuming and almost  
23 always means consultant resources, as well as  
24 probably some of the finest analytical resources in  
25 the organization.

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1           So when a utility decides or an owner  
2           decides to go down this path, it necessarily begins  
3           to build another analysis that looks like it's PRA,  
4           but it's really a GSI-191 dedicated PRA, correct?  
5           It's a dedicated GSI-191 PRA. Simple.

6           MR. FONG:       Which approach are we  
7           talking, the detailed or the simplified?

8           MEMBER SKILLMAN: I'm on number nine of  
9           your reg guide, and I'm a licensee and I'm reading  
10          this and I'm saying, hey, if we want to use a risk-  
11          informed approach, we've got to submit a license  
12          amendment request and we've got to do a special PRA  
13          just for this 191, at least a calculation that  
14          looks like a PRA. Is that right?

15          MR. FONG:       Well, it's up to the  
16          licensees how they would want to do that. I mean,  
17          I think we would expect that a licensee would try  
18          to start with an existing PRA model they had,  
19          unless it's built something completely from  
20          scratch. But we'll review whichever, whatever the  
21          licensee submits to us.

22          MEMBER SKILLMAN:       And what's your  
23          expectation?

24          MR. FONG:       That they would start with  
25          an existing model, modify it as necessary to

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1 calculate the risk attributable to debris.

2 MEMBER SKILLMAN: So would they end up  
3 with two counts or just one count?

4 MR. FONG: Well, they would have, I  
5 think, two counts, one for in-vessel, one for  
6 strainer. Two basic events is what we've typically  
7 seen licensees talk about doing.

8 MEMBER SKILLMAN: Isn't that what John  
9 was talking about? Here you have this main PRA for  
10 the unit, and now you have this calculation that is  
11 the calculation for Reg Guide 1.229. And the  
12 reason I'm asking this question is because it seems  
13 to me that it raises some either configuration,  
14 some documentation and analytical configuration  
15 control challenges or some harmonization questions.  
16 And what can be a burden on the licensee is  
17 ensuring that the GSI-191 calculation and the main  
18 PRA for the unit remain consistent, aligned, and  
19 accurately true to each other. How does this make  
20 sure that happens? How does this make reg guide  
21 make sure that that consistency remains?

22 MR. FONG: So, I mean, what you're  
23 bringing up and I think what Mr. Stetkar brought up  
24 earlier is a broad question that we face in PRA all  
25 the time. We've seen licensees come forward, for

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1       example, provide information for us in the  
2       significance determination process, and they'll  
3       say, "Well, we don't want to use our 805 PRA. We  
4       have a different PRA."

5               So this kind of thing happens.  
6       Licensees sometimes have different PRAs for  
7       different purposes, and I don't think it's the job  
8       of this reg guide, unfortunately, to solve that  
9       broadly. I think if a licensee goes forward and  
10      they create, say, two new basic events used to  
11      calculate the risk attributable to debris for this  
12      analysis, your question is a very fair and  
13      reasonable one. What happens to those basic events  
14      going forward for, say, mitigating strategies  
15      Fukushima PRA or something? I don't think we can  
16      solve that with this reg guide. There's guidance  
17      out there on risk-informed laws, SDPs, all the  
18      various applications of PRA that licensees need to  
19      follow.

20             MR. LAUR: Yes, I don't know if this  
21      will help or not, but, okay, let's assume we're  
22      using a simplified approach. We do a test, which  
23      has a lot of uncertainties but hopefully some  
24      conservatism in it, and we say that's our go-no-go.  
25      We use conservatism maybe in how we put the entire

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1 LOCA frequency on one weld that's the smallest,  
2 whatever the simplified approach says. You could  
3 do that portion of it without your PRA at all.  
4 What you're doing is an estimate of the risk  
5 attributable to debris, and you show that it's  
6 small and consistent with the Commission's Safety  
7 Goal Policy Statement, which means you've met one  
8 of the five key principles that are in Reg Guide  
9 1.174, and that will be it. If you never intended  
10 to use your PRA for anything else, we would have no  
11 hook to require you to update the PRA, and this  
12 analysis would stand on its own.

13 Now, as C.J. pointed out, when you come  
14 in for some other application, Reg Guide 1.174 has  
15 got the total plant risk on one axis and the delta  
16 plant risk on the other axis, this would have to be  
17 added in there, which I think the issue we're  
18 debating or talking about here is the fact that  
19 this bounding approach, in my opinion, other than  
20 the deterministic part which I can't speak to, it's  
21 very bounding potentially, it's very conservative.  
22 That has the potential of maybe skewing your total  
23 risk number. You're going to have this large break  
24 LOCA that's a larger term than it would be if you  
25 didn't have debris, and we don't know how much

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1 larger it is.

2 But, yes, to answer your question, this  
3 reg guide does not really talk about the baseline  
4 PRA model to the extent that -- it really talks  
5 about how you calculate the risk, the change in  
6 risk for this application. I don't know if that  
7 helped.

8 I guess your other question is about  
9 the application, and I guess I didn't understand  
10 that one about requiring an application. That's  
11 not really required here. That's required in the  
12 regulations --

13 MEMBER STETKAR: No, sir. No, sir,  
14 it's required here, page 17, item nine. It's in  
15 your reg guide.

16 MR. LAUR: Yes, but the reg guide  
17 doesn't require it. It's 50.46(c) that will  
18 require it, or, if that never becomes a rule, it's  
19 the fact that this is an exemption that requires  
20 it. But this reg guide is merely repeating a  
21 requirement that's elsewhere.

22 MEMBER STETKAR: Okay. That helps.  
23 Thank you.

24 MR. D. HARRISON: This is Donnie  
25 Harrison of the staff. I just want to clarify most

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1 of these plants have a basic event in their PRA  
2 model that's a black box. It just says sump clogs.  
3 It's given a ten to the minus six failure rate. So  
4 when someone decides that they want to use this  
5 risk-informed approach, they are going to need to  
6 change that basic event to reflect what the actual  
7 condition of the plant is when they're done.  
8 You're no longer going to have a black box event  
9 that says ten to the minus six sump clogging. It's  
10 going to be here's my model for debris and, if you  
11 do the simplified go-no-go, it's going to be a lot  
12 of, for this scenario it's 1.0.

13 So they are going to have to do that to  
14 make that work. Otherwise, their PRA base model  
15 won't be correct. It won't be reflecting the as-  
16 built plant. So I hear Dr. Stetkar's point. It's  
17 worth noting and going forward. It was a debate we  
18 had a few months ago about the terminology in the  
19 existing reg guide at that time about what is a  
20 base PRA.

21 So I think we've taken the note. It  
22 might be worth considering if we should at least  
23 put a note into the reg guide or somewhere the  
24 expectation that you would update your base PRA to  
25 reflect what your current plant configuration looks

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1 like after you do this analysis. That way, it  
2 doesn't get lost going forward. I think it's worth  
3 noting.

4 CHAIRMAN BALLINGER: That's very  
5 helpful. Thanks.

6 MEMBER STETKAR: Let me try, since  
7 we're talking about base PRA, I'm going to come  
8 back to uncertainty. We have two and a half hours  
9 left, I think. If I look at the guidance in  
10 Appendix B now, if I'm going to do the simplified  
11 approach, Section B.1 tells me what I need to do  
12 from Appendix A, the detailed approach. And by  
13 omission, it tells me what I don't need to do from  
14 Appendix A. And one of the things that I don't  
15 need to do from Appendix A is PRA model changes,  
16 Section A.3. That's omitted from what I need to  
17 do.

18 So, okay, I don't do any PRA model  
19 changes. But Section A.3 talks about some really  
20 reasonable stuff because, in my PRA, I've got three  
21 trains. Let me call myself South Texas. Any one  
22 of those three trains is success, but, as we know,  
23 it makes a difference whether I have A and only A,  
24 B and only B, C and only C, A and B, A and C, B and  
25 C, or all A, B, and C running, and whether I've got

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1 spray running in conjunction with that.

2 So there's a lot of different  
3 combinations of things that I can have going on in  
4 my PRA that will affect debris transport to screens  
5 and affect that number that I'm going to calculate.  
6 So if I don't change my base PRA to account for  
7 those things, how am I going to use what's in my  
8 base PRA to have any reasonable assessment of  
9 debris transport and debris deposition on screens  
10 so that they can come up with that number?

11 MR. SMITH: The way that that is  
12 treated, at least in the pilot in the simplified  
13 method -- and if other plants come in with  
14 different methodologies, we'd have to look at it --  
15 they have basically maximized the debris transport,  
16 they've taken the design basis assumption that two  
17 trains are in service. So they've maximized the --

18 MEMBER STETKAR: No, no, wait a minute.  
19 Design basis assumption doesn't, nature doesn't  
20 know about law, okay? So I can have A and only A,  
21 B and only B, C and only C, A and B, A and C, B and  
22 C, or A, B, and C. Those are a -- if I have zero,  
23 that's core damage already, so I'll give you that  
24 one.

25 MR. SMITH: They've bounded, they have

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1 taken the maximum transport that could occur,  
2 assumed it went to two strainers, and then they  
3 also did sensitivity studies that assumed only one  
4 train was running and the maximum transported  
5 debris to that single train strainer. So the way  
6 that the pilot plant did it --

7 MEMBER STETKAR: Okay, Steve, let me  
8 stop you there. Good for them. I don't see  
9 anything in this regulatory guidance that leads me  
10 to try to do that kind of an analysis. I don't see  
11 anything that says if you're going to take this  
12 simplified approach and you're not going to modify  
13 your base PRA to account for all of those myriad  
14 configurations that I can have, then here is what  
15 you should do. I don't see anything in here that  
16 says that.

17 MR. LAUR: I don't think you need to  
18 modify the base PRA to get those various  
19 combinations. If you're going to do a detailed  
20 approach in Appendix A, in which case you're going  
21 to have different flavors of basic events depending  
22 on whether it's train A, train B, train C, and, in  
23 fact, the pilot identified, I forget, 512 or  
24 something permutations because they've got three,  
25 you know, containment spray, three whatever, three

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1 high head, three low head. So they had 512 which  
2 they've mapped into 64 by symmetry, then they pared  
3 down to five.

4 So in a detailed approach, yes, you  
5 would need to add logic to a typical PRA where you  
6 say large break LOCA and you don't ask, you just  
7 know it wouldn't work for the success, right? They  
8 actually modified the tree to put all the various  
9 branches.

10 But for the simplified approach, if you  
11 can somehow, without modifying the PRA, determine  
12 the transport for the various combinations, you  
13 don't need to modify the PRA. And that's what they  
14 did. They didn't consider the case of all three  
15 working. They said the case of two sumps working  
16 is conservative for the three, and then they  
17 considered the single case. They did use a PRA to  
18 determine a split fraction of being in one state or  
19 the other --

20 MEMBER STETKAR: Steve, that's my whole  
21 point. Good for them. They did a lot of work on  
22 their particular plant. And after they did all of  
23 that good work to come up with that information  
24 about which of these configurations might be the  
25 most bounding, then they said, okay, I'm going to

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1 use this simplified approach and put some numbers  
2 in. This regulatory guidance is being written for  
3 everybody else, not them, and I don't see the  
4 regulatory guidance saying you ought to do  
5 something like that, whether it's actually  
6 something --

7 MR. SMITH: In Appendix B.

8 MEMBER STETKAR: In Appendix B. It  
9 says I need to do that in Appendix A. In Appendix  
10 B, all it says is I don't need to make any changes  
11 to my base PRA model, and I have to determine a  
12 threshold value for each debris type below which  
13 the debris cannot adversely affect -- it doesn't  
14 say that I have to go look for the most  
15 conservative configuration of all of my operating  
16 systems in the plant, not design basis, not  
17 licensing basis, not assumed for an FSAR, but the  
18 most conservative configuration, and then do my  
19 debris transport and deposition under those  
20 conditions. It doesn't tell me to do that. It  
21 just says I don't need to make any changes and do  
22 some magic and come up with a number.

23 MR. FONG: It does say if you don't  
24 evaluate a particular scenario, you've got to take  
25 a CCDP of 1. So --

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1                   MEMBER STETKAR:    The scenario doesn't  
2                   exist.   Let's take a simple place where I've got  
3                   two injection pumps and two spray pumps, okay?  And  
4                   I have I think four combinations of those things  
5                   running.   It doesn't tell me to take the most  
6                   conservative of those four combinations.   All I  
7                   know in my PRA is that I've got at least one  
8                   running, and maybe I haven't even evaluated spray  
9                   because it's only for core damage and I don't care  
10                  about spray.

11                 MEMBER BLEY:   Conservative in terms of  
12                  transport.

13                 MEMBER STETKAR:   In terms of transport.  
14                  In terms of transport.    You're not modeling  
15                  transport here.

16                 MR. LAUR:    Let me just reiterate what  
17                  C.J.   said,   B.3C,   it says plant space and  
18                  configuration not explicitly treated in a  
19                  simplified approach and which would not screen out  
20                  under B.1 should be assembly to core damage.  Maybe  
21                  what you're saying is it needs to be clearer, but  
22                  it's not the PRA model that needs -- I mean, that  
23                  may be one way of determining these plant states.  
24                  But in a simplified approach, if you had to take a  
25                  two-train plant, they can consider both trains

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1 working or one train working.

2 MEMBER STETKAR: Does it make a  
3 difference if I have both trains of injection, both  
4 trains of spray, all four pumps running, any  
5 combination of those four pumps running? It might  
6 make a difference for core damage. It might make a  
7 difference for delta LERF.

8 MR. LAUR: Certainly. But the PRA  
9 model isn't what's going to tell you that, unless  
10 you modify the PRA model.

11 MEMBER STETKAR: My whole point.

12 MR. LAUR: But you can tell that  
13 without the PRA model.

14 MEMBER STETKAR: Yes, I can do a PRA,  
15 in principle, on an Excel spreadsheet with enough  
16 permutations and combinations. People don't try to  
17 do that because it gets real complicated.

18 MR. LAUR: But we're talking about  
19 debris transport under different pump running  
20 configurations.

21 MEMBER STETKAR: Yes.

22 MR. LAUR: What does it have to do with  
23 the PRA? That's all the phenomenological part that  
24 GSI-191 has raised, I guess.

25 MEMBER SKILLMAN: So let me jump in.

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1 This is exactly the issue that I perhaps ineptly  
2 was trying to point to. Like John said an hour  
3 ago, the plant has one PRA. It's one huge calc.  
4 And what we're talking about here is, actually,  
5 based on the gentleman who spoke a few minutes ago,  
6 a sub-routine within this huge big calc is  
7 extraordinarily important to the conclusion of that  
8 calc. And the calc that I refer to is a capital C  
9 calc. It's the plant's PRA. And I'm thinking  
10 there ought to be one, not two. It ought to be  
11 integrated so that all of the other things that are  
12 going on concurrently are identified.

13 So I'm kind of stuck on this idea that  
14 this reg guide presumes that you can make a license  
15 amendment request for use of this methodology for  
16 treating GSI-191 when the validity of this is only  
17 as good as its place in the overall plant PRA.  
18 Maybe I'm coming at this -- I'm the guy that hiked  
19 down and found chicken wire as the screen in some  
20 of the emergency sumps. I'm the guy that watched  
21 Davis-Besse learn that if you took the take-off to  
22 cool the recirculation pumps to the side of the  
23 casing instead of the top of the casing, the pump  
24 would survive. If that change was not made, the  
25 pump would not survive. There are so many fine

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1 details that are out in the field that affect this  
2 that maybe I'm affected from the practical  
3 perspective. But from my practical perspective,  
4 the sub-calc has got to fit into the bigger calc,  
5 and it all has to work. So I'm stuck on that idea.

6 MR. LAUR: I don't know if this will  
7 help or not, but I'll let one of my colleagues try.  
8 For the detailed approach and what South Texas, as  
9 the pilot, originally started out to do had a very  
10 complex phenomenological model feeding into a PRA,  
11 if you will. They identified, if I recall, seven  
12 failure mechanisms involving the screens and/or the  
13 core, different parts. Mechanical failure, you  
14 know, deposit section, etcetera. And they put  
15 those into two basic events, two primary basic  
16 events in the model.

17 But because of what Member Stetkar was  
18 saying, the different, you know, if you had one  
19 train working, no train working, all trains  
20 working, you get different debris loadings and  
21 everything. They had to look at a huge number of  
22 combinations, which they were able to move down  
23 into five, let's say representative types of  
24 thermal hydraulic situations.

25 So for each of these two basic events,

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1 they had five flavors, five different failure  
2 probabilities, depending on where you were in this  
3 sequence, okay? That's a typical PRA approach.  
4 You've modified the PRA to have these, so you can  
5 differentiate between one pump and two pumps  
6 because we'd normally do that. And so they can put  
7 these basic events in, and then, for the initiating  
8 event frequency, they have the typical LOCA  
9 frequencies. When you get out, you hopefully will  
10 get a new CDF number and a new LERF number that  
11 show you the effects of debris.

12 Now, the phenomenological part was very  
13 complex. We couldn't understand parts of it. We  
14 were not sure about other parts of it. How you do  
15 the uncertainty through that parametric uncertainty  
16 is difficult to understand if you're averaging  
17 things properly, which is, I think, one reason that  
18 they came up with their simplified approach, which  
19 is a little different than what we have here but  
20 similar. Okay.

21 That is modifying the PRA.

22 Now, if all I'm interested in is the  
23 delta risk, I understand some of this stuff feeds  
24 into the PRA model, but if I didn't even have a PRA  
25 model I can do the simplified approach. I can take

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1       these deterministic approaches to figure out how  
2       much debris is generated and transported under  
3       whatever, under 50, you know, 511 combinations if I  
4       wanted, and for each one of those I could then go  
5       to each potential LOCA location, get a frequency  
6       for that individual weld, you know. That's part of  
7       the debate we're having. But I can do that and  
8       say, okay, this one, when it's all transported  
9       under this scenario with one sump running instead  
10      of two, I get this much debris, go-no-go. It's a  
11      go.

12               Next scenario, next weld. Go through  
13      all the welds, go through all the possible  
14      scenarios, assign a conditional core damage  
15      probability of 1.0 if it's above this hopefully  
16      conservative number, no core damage if it's low,  
17      and I'm going to get a delta risk. I haven't  
18      touched a PRA model.

19               Now, it's true if you're going to say,  
20      well, what's the chance I'm in one sump versus two  
21      sumps, you're going to go to your base PRA model.  
22      But that hasn't anything to do with the debris,  
23      that has to do with pumps starting and stopping  
24      and, you know, failing to start or failing to run -  
25      -

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1                   MEMBER STETKAR:    I guess, Steve, you  
2                   know, my mind glazes over when I hear people say,  
3                   well, I'm a PRA guy, I'm not a deterministic guy,  
4                   so I don't understand about that debris transport.  
5                   So I'll say I don't understand anything.    My  
6                   simple-minded approach is there's some likelihood  
7                   of being in each of the possible configurations of  
8                   the plant, and there is then some conditional  
9                   likelihood, given that configuration, that a  
10                  certain amount of debris from location A will be  
11                  transported to the screens and the core, and there  
12                  is some conditional likelihood, given that, that I  
13                  win or lose.       And I'm not talking about  
14                  deterministic stuff.   All I'm saying is that's my  
15                  understanding of the world.

16                 So I don't want to partition this up  
17                 into, well, the PRA guys do this and the  
18                 deterministic guys do that.   That's the way the  
19                 world works.

20                 And now you're saying, well, I'm making  
21                 conclusions about the delta risk.   Well, the delta  
22                 risk accounts for all of those likelihoods.   Maybe  
23                 I account for them conservatively, whatever that  
24                 means.   Maybe I account for them realistically,  
25                 whatever that means.   But the delta risk somehow

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1 has to account for those likelihoods.

2 So what I'm asking is how does the  
3 guidance for the simplified approach tell me that I  
4 somehow need to account for those likelihoods, and,  
5 if I don't account for all of those relative  
6 likelihoods, at least search for the most limiting  
7 combination of running and not running the  
8 equipment and debris generation for each location  
9 such that I can then do what is determined, is  
10 called a bounding assessment? I don't see it  
11 telling me to do that.

12 If you're saying I can do it outside of  
13 the PRA, yes, I can have a spreadsheet where I have  
14 all of those likelihoods and all those 512 South  
15 Texas combinations and do all of those little side  
16 calculations. Okay. Well, to me, that smells a  
17 lot like a PRA, but, you know, you might call it  
18 something different, give it a different name. But  
19 it doesn't tell me to do that. It just tells me to  
20 define scenarios, and I don't know how I define  
21 those scenarios if I -- me, if it were me, I'd  
22 change the PRA model because that gives me those  
23 likelihoods, but I'll admit I can do it on the  
24 side. It doesn't tell me what I need to be careful  
25 about when I define those scenarios.

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1 MR. SMITH: That's why we referenced to  
2 Reg Guide 1.82 to define the debris generation and  
3 transport part of this. And that's not in Appendix  
4 B, but it's up front, and that's why we talked  
5 about it. It's in the regulatory position section  
6 where we talk about that.

7 So that was the meaning of doing that,  
8 and I know I'm not answering your question about  
9 how this ties into a PRA, but that's how we tried  
10 to tell people that they need to use conservative  
11 methods to determine their deterministic parts.

12 MEMBER STETKAR: Yes, but it still gets  
13 back to this notion of likelihood and delta risk.  
14 Reg Guide 1.82 doesn't --

15 MR. SMITH: It doesn't talk about that.  
16 Absolutely.

17 CHAIRMAN BALLINGER: I had a question  
18 from Mike Corradini. He says that that Joy could  
19 do it as well as I did. At the top of page two of  
20 Reg Guide 1.229, we see bold words. This reg guide  
21 describes acceptable methods and approaches for  
22 addressing 10 CFR 50.46(c)(e), alternative risk-  
23 informed approach for addressing the effects of  
24 debris on long-term cooling and applicable portions  
25 reporting corrective actions, da, da, da. Then

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1 here's the bold part, "While the general risk-  
2 informed approach of this reg guide may be applied  
3 to any reactor designed within the scope of 10 CFR  
4 50.46(c), many of the specific approaches, e.g.  
5 WCAP 16 530 MPA, for chemical effects and  
6 acceptance criteria, were developed for the current  
7 fleet of pressurized water reactors. Entities,  
8 licensees, or applicants using this guidance should  
9 justify that the application for each approach or  
10 method used meets the intent of this guidance."

11 And here's his question, "I'm not sure  
12 what this means. Does it mean that the staff does  
13 not expect BWR licensees to use this reg guide  
14 since it will pass the deterministic approach?"

15 MR. FONG: So I'll field that one.  
16 First, I guess, since the font is not bold, I guess  
17 Dr. Corradini means the words themselves are bold,  
18 so I'll be careful here.

19 CHAIRMAN BALLINGER: Well, okay. He  
20 said see bold words. I was looking for the top of  
21 page two, and I couldn't find it so . . .

22 MR. FONG: What that means is this:  
23 when we set out to write this reg guide, we started  
24 by looking at PWRs, BWRs, SMRs. People said what  
25 about large light water reactors? What we found is

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1 this, there's so many different analyses that need  
2 to be done. You've got to look at coatings.  
3 You've got to look at debris. You've got to look  
4 at different ECCS configurations. It was extremely  
5 challenging to try to envision what that might look  
6 like for an SMR or even a BWR because we didn't  
7 have a pilot.

8 We also solicited feedback at a variety  
9 of public meetings from the industry and said, hey,  
10 anybody in the SMR community looking to use this?  
11 How about you guys? We didn't hear any feedback  
12 from a member of the industry saying we want this.

13 So given the challenge of trying to  
14 envision all these different specifics without a  
15 pilot and given the lack of demand for detailed  
16 guidance for another design, we chose to limit the  
17 reg guide, at least the things like WCAPs and  
18 referencing certain topical, to the information we  
19 had: existing PWRs looking to resolve or respond to  
20 Generic Letter 2004-02.

21 We also think that's consistent with  
22 the direction we received from the Commission in  
23 two staff requirements memoranda where they said  
24 modify 50.46(c) to allow licensees to GSI-191,  
25 which, of course, is operating PWRs. But we didn't

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1 want to give the impression that somebody else  
2 couldn't come in later and provide additional  
3 information and use the method, like, for example,  
4 in AP-1000.

5 So we wrote the guidance for the  
6 information we had today. But, again, it's a reg  
7 guide. Licensees can come forward and propose  
8 alternate methods. And if they are BWR, SMR, they  
9 would probably need to do that.

10 CHAIRMAN BALLINGER: Mike is off mute.  
11 Do you have any more things to say, Mike? I  
12 thought it was off mute.

13 MEMBER CORRADINI: Can you hear me now?

14 CHAIRMAN BALLINGER: Yes.

15 MEMBER CORRADINI: Okay. So what I  
16 hear as the answer is that BWRs are probably not  
17 going to use this.

18 MR. FONG: I can say that me,  
19 personally, and having asked the question in  
20 several public meetings, I have not heard a BWR  
21 licensee say that they want to use this. I can't  
22 tell you that, you know, you'll hear from the  
23 industry after us. Maybe they have a different  
24 perspective but --

25 MEMBER CORRADINI: Okay. All right.

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1       Then I'll wait on the question. That's a fair way  
2       of putting it. We can get industry's -- I knew  
3       that they were going to say something. We'll wait  
4       until they come up then. Thank you.

5               But from your perspective, given the  
6       public comments and your public meetings, this reg  
7       guide and this approach was designed specifically  
8       to resolve a PWR generic issue, end of story?

9               MR. FONG: Yes.

10              MEMBER CORRADINI: Thank you.

11              MR. LAUR: This is Steve Laur. Just to  
12       add to that. The big-picture steps in Section C of  
13       the reg guide, not the appendices and not all the  
14       references to specific testing and other -- they  
15       follow the proposed rule that's up with the  
16       Commission now I guess, and those steps would apply  
17       to anybody. I mean, they talk about looking at the  
18       various scenarios that can be affected, how you,  
19       you know, looking at debris generation and  
20       transport, etcetera, the trust program is done  
21       under the monitoring program. Those things, I  
22       think, are generic. It's just that when we got  
23       down into all of these references, we don't have  
24       the experience for the other type of reactors. So  
25       that's why that caveat is up at the beginning.

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1                   MEMBER CORRADINI: So let me ask a last  
2 question, and then I'll wait for the industry's  
3 reaction to this. So at least as we sit now, there  
4 is no issue for this sort of long-term cooling that  
5 would have BWRs starting, BWR licensees, excuse me,  
6 to worry about this. So from a completeness  
7 standpoint, is it that there would be just, they  
8 would essentially not need to show long-term  
9 cooling via this what I'll call 50.46(e) approach?  
10 They would essentially show that their debris  
11 loading is such that they don't have an issue?  
12 Because now it's part of the rule.

13                   MR. SMITH: That's right. They would  
14 use deterministic methods to determine their  
15 licensing basis.

16                   MEMBER CORRADINI: Okay. And their  
17 licensing basis is not 15 grams per assembly.

18                   MR. SMITH: No. Well, some PWRs, which  
19 this could apply to them if they chose, do have 15  
20 grams per fuel assembly as their licensing basis.  
21 They have adopted that.

22                   MEMBER CORRADINI: Okay, okay, all  
23 right, all right. Thank you.

24                   MEMBER BLEY: I'd just toss in one  
25 comment. A lot of what John discussed, I think,

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1 Steve, I went back and read the regulatory position  
2 part again, and I think they're probably covered.  
3 But what strikes me is being less than specific in  
4 Appendix B. It seems to me this kind of puts you  
5 in a spot where you're much more likely, when you  
6 review any applications of this type, to end up  
7 with a lot more RAIs and a more extended review  
8 process and some dissatisfaction on both sides, and  
9 I think clarity could really help in that area.

10 MEMBER STETKAR: Let me go back to the  
11 topic of uncertainty. I said I wasn't going to let  
12 it die. If I read Section B.2 about impact of  
13 debris, it says that, basically, I have a pass/fail  
14 criterion. If the assessed amount of debris on the  
15 strainers is more than X, I fail. If it's less  
16 than X, I pass.

17 It says these threshold values are  
18 derived from testing that demonstrates that long-  
19 term cooling will be maintained under those debris  
20 loads. Well, I'm now not a deterministic expert on  
21 this testing or the analyses. I've sat in on a  
22 bunch of subcommittees that have discussed those  
23 issues, and, to me, there seems to be reasonable  
24 amounts of uncertainty about that threshold value  
25 and, yet, this is simply a pass/fail.

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1           So then I go and look at things that  
2       say, well, we accept methods in Reg Guide 1.82  
3       because they're considered to be adequately  
4       conservative. So we're going to use those as our  
5       so-called consensus models in the sense of NUREG-  
6       1855.

7           Now, the interesting thing, it says the  
8       NRC considers the accepted deterministic methods to  
9       be conservative enough to compensate for  
10      uncertainty. In addition, portions of the analyses  
11      using NRC staff-accepted deterministic methods do  
12      not require quantification of uncertainty model or  
13      parametric.

14          Well, I'm sorry, a consensus model, if  
15      I establish a consensus model, according to NUREG-  
16      1855, I don't need to account for model  
17      uncertainty. There's nothing in NUREG-1855 that  
18      says I don't have to account for parametric  
19      uncertainty within that parametric, within that  
20      consensus model. It just says I don't need to  
21      account for model uncertainty. That is the model  
22      that everybody agrees is the good model.

23          If there's huge variability in the  
24      parametric portion of that model, huge uncertainty,  
25      NUREG-1855 doesn't give me a pass on that part of

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1 the analysis. So I'll say to comply with the  
2 guidance in NUREG-1855 -- I'm sorry. We don't  
3 comply with guidance. To follow the guidance in  
4 NUREG-1855, I'm led to believe that even if I have  
5 a consensus model, I have to account for at least  
6 parametric uncertainty within that consensus model.  
7 This tells me I don't need to do that. I'm curious  
8 about that. So why is that?

9 MR. FONG: I think, I'm thinking of the  
10 consensus models that were, that we've seen so far,  
11 and they tend to deal, they're derived largely from  
12 deterministic calculations. For example, the zone  
13 of influence is a sphere with a certain set  
14 diameter.

15 I'm struggling to think of what  
16 parameter you would bury in those models.

17 MEMBER STETKAR: I'm talking about  
18 amounts and types of debris and transport of that  
19 debris and deposition of that debris and the  
20 effects of chemicals and particulates and fibers in  
21 that debris. Those are parameters in these models.

22 MR. FONG: And they're pegged high for  
23 this --

24 MEMBER STETKAR: How do you know that  
25 they're pegged high? They can't get any worse? Do

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1       you know that? Or is there some information --  
2       this gets back to where I'm eventually going to  
3       close the loop here. This gets back to what Dana  
4       is talking about. Do we know that it can't be any  
5       worse than what's in those calculations, or are  
6       they, as is characterized here, conservative  
7       enough?

8               MR. SMITH: When we, when we wrote this  
9       Reg Guide we didn't think it would be appropriate  
10      to create a higher or a more conservative model for  
11      the people implementing the risk-informed  
12      methodology than those implementing the  
13      deterministic methodology which we have accepted in  
14      the past.

15             MEMBER STETKAR: And I don't care what  
16      you've accepted in the past. I'm talking about now  
17      a risk-informed decision making process. I'm not  
18      advocating a more conservative model, I'm  
19      advocating the examination and consideration of  
20      uncertainties within that model that's been used.  
21      And not uncertainties regarding that model versus  
22      somebody else's model because I'm going to give you  
23      the fact that we have a consensus model. But there  
24      are parametric uncertainties in terms of quantities  
25      of debris generated.

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1                   Given that established spherical zone  
2                   of influence there is uncertainties about the  
3                   transport of that debris, the timing of the  
4                   transport of the debris, the types of the debris  
5                   and how the debris affects either the strainers or  
6                   anything downstream from the strainers.

7                   MR. SMITH:       There is a lot of  
8                   uncertainty. And, you know, we've studied these,  
9                   these phenomena for years. And there's still a lot  
10                  of uncertainty. And, you know, and the cost to  
11                  eliminate or reduce the uncertainty has not, you  
12                  know, we just haven't seen the need to do that  
13                  because of the way we have implemented the  
14                  deterministic model.

15                 MEMBER STETKAR:   And don't get me  
16                 wrong, I don't care what the deterministic people  
17                 have done, they have to live with and the staff has  
18                 to live with what they've done. I'm now talking  
19                 about these applications.

20                 If we admit that there is a lot of  
21                 uncertainty we ought to address that in a risk-  
22                 informed decision making process. In other words,  
23                 we talk about in the risk-informed decision making  
24                 process, do I meet my safety margins? Well, it  
25                 sounds like it's a strict pass/fail. It's either

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1 black or white. I'm either absolutely above the  
2 line or I'm absolutely below the line.

3 The uncertainty might tell us, well,  
4 you know, there's a 3 percent chance that I'm above  
5 the line but I'm willing to accept that. Or a 7  
6 percent chance or a 73 percent chance if it's a  
7 really strange looking distribution. And if I take  
8 that approach, it can address, I think, I hope,  
9 some of Dana's concerns about the unknown unknowns.  
10 How big could they be? And have I thought about  
11 them in this concept of looking at the uncertainty  
12 in my available safety margins.

13 And I don't see any of that type of  
14 discussion other than, well, you have to have an  
15 uncertainty distribution for the LOCA frequency.  
16 No, it's just part of the calculation and it may be  
17 the smallest uncertainty for all I know.

18 MR. SMITH: Yeah, but the safety  
19 margins are really in addition to, you know, the  
20 delta CDF. And it's another thing, the defense in  
21 depth is on top of what we're calculating as a  
22 potential failure. The safety margins are what we  
23 base our failure on.

24 So if we say that the structural  
25 failure's going to occur at 10 psi, that was

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1       calculated using an ASME code. It's probably going  
2       to fail at 20 psi. So that's a safety margin. I  
3       mean, I think the safety margins, there's none of  
4       those lost in the methodology we use here.

5               MEMBER STETKAR: Probably should have  
6       not used the term "safety margins" because I, I'm  
7       not an attorney. Let me just use the term a risk-  
8       informed decision about whether or not my plant is  
9       acceptable. Even the term "acceptable" might get  
10      me in terms, in trouble with an attorney.

11             I'm trying to make a point here that  
12      when making decisions on a risk, based on a risk-  
13      informed approach. And those decisions are being  
14      made by people, the staff, the Commission, that  
15      this plant is either safe enough given what we  
16      understand about its debris, or it needs to do  
17      something to address debris under certain  
18      conditions.

19             And without an evaluation of all of the  
20      uncertainties, and I'm not necessarily talking  
21      about a detailed quantitative evaluation of every  
22      parametric uncertainty, but at least examining  
23      those. And maybe you can quantify them, providing  
24      that information so a decision maker says, well,  
25      yeah, you know there's a 97 percent chance that we

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1 meet the acceptance criterion. And, you know, a 3  
2 percent chance or some small chance based on some  
3 sort of qualitative evaluation of uncertainty that  
4 we don't. But I'm willing to accept that risk.

5 There's no discussion in here about  
6 that type of uncertainty evaluation, especially  
7 with regard to what you guys are calling the  
8 deterministic part of the calculation.

9 MR. GIITTER: Dr. Stetkar, let me just  
10 add I think what the staff is trying to do here is  
11 to come up with a methodology that can be easily  
12 applied. Granted it's not perfect. But, you know,  
13 our measure is reasonable terms of adequate  
14 protection, not absolute assurance.

15 And, you know, you have to strike a  
16 balance between the degree of effort and complexity  
17 that goes into something versus something that can  
18 be used and usable. And I think what the staff did  
19 is they tried to account for the major areas of  
20 uncertainty. And we took a conservative approach,  
21 granted. It may not have accounted for all the  
22 uncertainties but, you know, given that what we're  
23 trying to do here is to come up with a method  
24 that's reasonable and relatively reasonable to use  
25 and it will allow the staff to make a decision

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1 without a lot of effort on our part or on the part  
2 of the licensee. I think it's a reasonable  
3 balance.

4 MEMBER STETKAR: I'm just going to let  
5 that stay on the record because it's on the record.

6 Without assessing uncertainties, people  
7 have made really bad decisions in the past.

8 CHAIRMAN BALLINGER: More questions?

9 MEMBER STETKAR: I do, on different  
10 topics. I don't know if anybody else wants to talk  
11 about uncertainty.

12 But that's my whole point was if we're  
13 following the guidance in Reg Guide 1.174, that  
14 guidance says that in a risk-informed approach I  
15 should consider it and evaluate uncertainties. And  
16 that evaluation of uncertainties as part of a  
17 decision making process isn't just the uncertainty  
18 in the LOCA frequency. With some sort of assertion  
19 that everything else is so conservative that it  
20 doesn't, the uncertainty doesn't matter, especially  
21 if I know there are large uncertainties and that  
22 everything else.

23 Okay. Now, different topic. Scope of  
24 the analyses. Is this process intended to only  
25 address debris generated by only LOCAs?

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1 MR. FONG: No.

2 MEMBER STETKAR: Okay, I'm glad to hear  
3 that because there's so much discussion of LOCA  
4 frequencies and what LOCA frequency I should use  
5 and what LOCA scenarios I should develop, I kind of  
6 lost that. So is the staff's expectation, for  
7 example, in a pressurized water reactor that I  
8 should look at all transient events that can lead  
9 to feed and bleed cooling, for example?

10 MR. FONG: Well, I think our  
11 expectation is that LOCAs would probably contribute  
12 the most. But any --

13 MEMBER STETKAR: What? Wait, wait.  
14 I'll stop you right there.

15 MR. FONG: Okay.

16 MEMBER STETKAR: Because you're making  
17 an assertion. How do you know that?

18 MR. LAUR: Well, I guess the real  
19 answer is yes. If you look at, if you look at  
20 Section C of the Reg Guide that's how it starts  
21 out.

22 MEMBER STETKAR: It does start out that  
23 way.

24 MR. LAUR: Well, no, and there's an  
25 interesting little transition sentence in there

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1        somewhere that says because LOCAs are, as C.J.  
2        mentioned, are, you know, it's not that they're  
3        necessarily dominant -- it turns out that they are  
4        based on the pilot -- but because they're  
5        problematic in terms of having to assign  
6        frequencies, all these things we've been talking  
7        about that we removed from Appendix C.

8                    MEMBER STETKAR:    Steve, I looked up my  
9        notes in a meeting that we had with the pilot, and  
10       I actually asked them, Gee, have you thought about  
11       debris that could be generated when the ruptured  
12       disk on the pressurizer relief tank blows after a  
13       feed and bleed cooling scenario?

14                   He said, Gee, no, we haven't thought  
15       about that. We'll get back to you.

16                   I asked him, Have you thought about the  
17       amount of debris that could be generated by a steam  
18       liner feedwater line break that would then devolve  
19       into a feed and bleed cooling scenario? Maybe not  
20       so important for their 3-train plant, but a lot  
21       more important for a 2-train plant.

22                   They said, No, we haven't thought about  
23       that. But the steam line breaks aren't very  
24       important to us.

25                   So I'm not sure how the pilot study has

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1 addressed those because they told me they hadn't.

2 MR. LAUR: Well, okay, but they have.  
3 See, because of your excellent question when we got  
4 the license renewal request they not only  
5 considered those --

6 MEMBER STETKAR: Oh good.

7 MR. LAUR: -- but they had a very -- in  
8 fact you'll see a screening in the Reg Guide that  
9 was generated as a result of what the screen they  
10 used -- but in fact if you look at our RAIs, we  
11 have some beta seismic event, with a seismic event  
12 and that dislodged insulation.

13 MEMBER STETKAR: You're one step ahead  
14 of me.

15 MR. LAUR: Some plants, yeah, we'll  
16 steam line, feed line this into our licensing  
17 basis. We said, that's not how we do this.

18 So, yes, it's everything. But they're  
19 allowed, and the Reg Guide says it's allowed up  
20 front to do screening, just as the standard allows.

21 MEMBER STETKAR: But you're not allowed  
22 to screen on frequency of LOCA. You have to  
23 consider every LOCA, even if the frequency is 10 to  
24 the minus 18th because of the way you've  
25 partitioned it down, down to locations.

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1                   You're not allowed to screen on  
2 frequency of LOCA. That's clearly said up front.  
3 But apparently you're allowed to screen on  
4 frequency of these other things?

5                   MR. LAUR: Well, if it's the whole  
6 plant. The LOCA being location-specific. That's  
7 why we put that specific --

8                   MR. FONG: Caveat.

9                   MR. LAUR: -- caveat in there about the  
10 LOCAs because we don't want things slicing and  
11 dicing so fine that they're all below truncation or  
12 something like that.

13                   But the, but no, the answer to the  
14 seismic question, which I thought would be some  
15 sort of one-paragraph response, turned out being  
16 for fragilities and --

17                   MEMBER STETKAR: Well, no, I mean the  
18 seismic stuff is a lot more interesting, if we want  
19 to start talking about that, because it's part of,  
20 it's part of my three or four questions on the  
21 scope of the evaluation.

22                   The seismic stuff, when I read the  
23 guidance, leads me to believe that I need to look  
24 at seismic-induced failures of reactor coolant  
25 system stuff, seismic-induced LOCAs. Seismic

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1 events are kind of interesting because the  
2 conditional likelihood of requiring feed and bleed  
3 cooling after a seismic event, given that I don't  
4 have offsite power, given that I don't have main  
5 feedwater, and I don't know what else is going on,  
6 diesels might have failed and things like that,  
7 could be relatively high.

8 Now, that isn't a seismic-induced break  
9 of any piece of piping.

10 MR. LAUR: Right.

11 MEMBER STETKAR: Nothing I saw. Okay.

12 However, lower acceleration seismic  
13 events, much lower accelerations than might fail  
14 any of the piping in a plant, might dislodge a  
15 whole lot of stuff inside the containment.

16 MR. LAUR: Right. We asked that  
17 question. And I think the answer was no.

18 MEMBER STETKAR: It won't? Okay.

19 MEMBER BLEY: No for the plants you  
20 asked about?

21 MR. LAUR: Sorry?

22 MEMBER BLEY: No for the plant you  
23 asked about.

24 MR. LAUR: Right.

25 MEMBER BLEY: Yes.

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1                   MR. LAUR:     Specifically each plant's  
2 going to have to go -- that's why the thing starts  
3 out with identifying all scenarios for which  
4 recirculation could be a mitigating act or failure.

5                   MR. SMITH:    Specifically for debris  
6 generated by a seismic event, a lot could be  
7 generated but it would not be generated in the form  
8 that would result in transport and head loss of the  
9 strainer. It's going to come off in big pieces.

10                  MEMBER BLEY:   Do we know that for sure?

11                  MEMBER STETKAR: Do we know that?

12                  MR. SMITH:    I, well, I guess you could  
13 project there's not going to be a lot of -- I think  
14 you could do a study on that and --

15                  MEMBER STETKAR: Dust and dirt?

16                  MR. SMITH:    Well, there would be a lot  
17 of dust and dirt. But that, that's a very small  
18 amount of debris compared to what's generated by a  
19 LOCA.

20                  MEMBER BLEY:    But your hunks are  
21 falling 50, 80, 100 feet.

22                  MR. SMITH:    Yeah. They're --

23                  MEMBER BLEY:    They won't be hunks.

24                  MR. SMITH:    It's like a pillow falling.  
25 That's how the -- only much tougher. That's these

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1 --

2 MR. LAUR: But also subsequent LOCA or  
3 the feed and bleed, you don't have anything to wash  
4 it there anyway.

5 MEMBER BLEY: Sure. You're got to get  
6 to a research scenario. But as Don's saying --

7 MR. LAUR: I'm talking the research  
8 scenario which is --

9 MEMBER BLEY: -- the seismic event is  
10 going to be, we suspect, more likely to get you to  
11 a feed and bleed --

12 MR. LAUR: Yeah, you're right.

13 MEMBER POWERS: In the aftermath of the  
14 limited set of earthquakes that I've experienced,  
15 everything is covered with dust.

16 MR. LAUR: Yeah.

17 (Simultaneous speaking.)

18 CHAIRMAN BALLINGER: A LOCA is a local  
19 event, one break so to speak. But a seismic event  
20 shakes the daylights out of everything. So I'm  
21 just wondering whether this dust might be a little  
22 more than dust.

23 MEMBER POWERS: Yeah.

24 CHAIRMAN BALLINGER: And might be a lot  
25 more than a little.

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1                   MEMBER STETKAR:   The concern I had is  
2                   that when we talk about -- and you're going to  
3                   eventually get me to the site-specific part of the  
4                   thing -- but the site-specific stuff talks about  
5                   direct and indirect seismically-induced LOCAs.  
6                   That's all it talks about. It doesn't talk about  
7                   any of this other stuff. I couldn't find it. I  
8                   was looking for it on here.

9                   MR. LAUR:    Their stuff I think is in  
10                  C.1.

11                  MR. FONG:    We have four criteria for  
12                  including a particular scenario in the analysis:  
13                  generates debris, transports debris, live on  
14                  recirculation, and wouldn't otherwise be a core  
15                  damage event. And I think those four capture --

16                  MEMBER STETKAR:   That's good as long as  
17                  applicants understand the expectation of what they  
18                  need to look at. Because as I said, the vast  
19                  majority of this guidance -- and I didn't do a word  
20                  count -- focuses on LOCAs, LOCAs, LOCAs, LOCAs.

21                  And the problem is that if a staff  
22                  reviewer looks at the guidance and it says LOCAs,  
23                  LOCAs, LOCAs, LOCAs, and an applicant comes in and  
24                  says LOCAs, LOCAs, LOCAs, LOCAs, it's not at all  
25                  clear that we're meeting the expectation, that

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1 broader expectation -- and I like those four up in  
2 C -- the broader expectations of the entire  
3 assessment.

4 Or, if a staff reviewer looks at that  
5 and says, Hey, wait a minute. You didn't tell me  
6 about 10 to the minus, you know, 3 seismic events  
7 that might require feed and bleed cooling with  
8 recirculation, and you haven't assessed the amount  
9 of debris that would be available during that. An  
10 applicant will say, Well, we didn't interpret the  
11 guidance that way because all it says was seismic  
12 LOCA, seismic LOCA, direct or indirect.

13 CHAIRMAN BALLINGER: So you're arguing  
14 for stronger words?

15 MEMBER STETKAR: I'm arguing for a  
16 clarity in the regulatory guidance such that people  
17 who are going to perform assessments according to  
18 this regulatory guidance can submit them to the  
19 staff for review. And the staff reviewers who are  
20 going to use this regulatory guidance to look at  
21 those applications are on the same page in terms of  
22 understanding the scope of what they need to look  
23 at.

24 MR. FONG: I think we have pretty good  
25 language. I'm certainly open for improvements but

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1 I mean we say up front that the systematic risk  
2 assessment should consider all hazards, initiating  
3 events and plant operating modes. It should not be  
4 limited to design-basis accidents, licensing-basis  
5 events, specific plant operating modes, or specific  
6 initiating events such as LOCA.

7 MEMBER STETKAR: Right.

8 MR. FONG: I mean we did say that up  
9 front, you can't just limit it to LOCA or design  
10 basis.

11 MEMBER STETKAR: It says -- that's,  
12 that's, C.J., I agree that the introduction stuff  
13 up front says all of that stuff. But then you get  
14 into things like screening. And the screening,  
15 other than telling me that I can't screen out LOCAs  
16 based on frequency, doesn't tell me much about what  
17 else I can screen out or how I can screen that  
18 stuff out.

19 So I could easily walk myself, as an  
20 applicant, into screening out all of those  
21 transients because everybody knows that LOCAs are  
22 only, the only important thing, and screening out  
23 seismic events that can result in transients other  
24 than a LOCA, because the seismic, the site-specific  
25 seismic guidance in here points me to seismically-

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1 induced LOCAs.

2 So, okay, I'll worry about seismically-  
3 induced LOCAs and say they're small in frequency  
4 compared to the other stuff or whatever that may  
5 be.

6 MR. LAUR: Well, we've referred to the  
7 standard, and I thought we referred to 1855 for  
8 some reason, because I didn't look into that as  
9 much as you did. But we refer to the standard,  
10 it's the standard -- standard -- it's the typical  
11 PRA screening as set forth in the standard and the  
12 guidance in NUREG-1855.

13 So we, I guess we could have repeated  
14 it here but. And I would hope our reviewers, well,  
15 I mean if you look at the RAIs, if you ask a pilot  
16 plant, this was one of the topics. I mean we --  
17 although they did submit an original submittal had  
18 here's all the initiating events we thought about  
19 and here's how we screened them. That's where we  
20 got those four bullets basically.

21 And we said, Well, what about seismic?  
22 And I forget what else we asked. But so.

23 MEMBER STETKAR: Well, if you think --  
24 again, I read this as a someone who would like to  
25 take this guidance and do the absolute minimum

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1 possible to satisfy an NRC staff review. And I, I  
2 tried to read the guidance to say what could I not  
3 do?

4 And I will agree that a strict  
5 interpretation of the introductory material in  
6 Section C would tell me that I can't get away with  
7 a lot. But I will tell you that most of the  
8 guidance seems to indicate that I can get away with  
9 quite a bit.

10 MR. LAUR: That's a good, good insight  
11 for us.

12 MEMBER STETKAR: So that all I'm saying  
13 is that in the guidance there's a lot of discussion  
14 of how one might do things. And, for example, in  
15 the site-specific seismic stuff there could be  
16 similar, just anecdotal guidance about don't forget  
17 to consider these types of things. You know, or  
18 our expectation is that you will consider these  
19 types of things.

20 Whether that goes in the screening part  
21 or whether that goes in the site-specific part,  
22 because a lot of these things are site-specific  
23 obviously, the whole thing is site-specific.

24 Just so it's real clear what the  
25 expectations are so that I'm as much concerned

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1 about a staff reviewer, after somebody's done a  
2 reasonable amount of analysis, bringing up these  
3 issues and, as Dennis said, initiating a long  
4 litany of RAIs that could extend into fairly  
5 substantial discussions, if not re-analysis, as I  
6 am that neither party, neither the applicant nor  
7 the reviewer thinks about these other issues.

8 MR. FONG: This is something we thought  
9 about quite a bit. And, in fact, this was an early  
10 public comment. We got a public comment saying,  
11 Hey, can't we just limit this to Mode-1 and LOCAs?

12 We said, no, it's all Modes, it's all  
13 hazards. For a specific plant if you do an  
14 analysis and show that the key driver is Mode-1  
15 LOCAs, fine. But it's up to the licensee to make  
16 that argument.

17 So this is certainly a very good issue  
18 and something that's come up before. And I think  
19 we've been pretty clear about what we want  
20 licensees to do. And we can certainly go back and  
21 see if there is some additional clarity to add  
22 throughout the guidance, but.

23 MEMBER BLEY: My impression is a bit  
24 like John's. But I see you have the right words in  
25 various places, but especially when you get back to

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1 the appendices, the focus is all there.

2 And for this concern we've had for many  
3 years that began with a steam rupture experience in  
4 another country, to not make it maybe more clear.  
5 The shift from the introductory discussion to the  
6 here's how we do it, really is where I see it  
7 slipping to heavy emphasis on LOCAs, although it  
8 does happen to both to some extent.

9 And 1855 is cited in the main body a  
10 few times in kind of general ways. Of course where  
11 it shows up in the appendices is just on the pipe  
12 ruptures, I believe.

13 CHAIRMAN BALLINGER: Next question?

14 MEMBER STETKAR: Actually, in the  
15 interest of time, I don't -- I mean I have a lot  
16 but I don't have any more -- those are the big ones  
17 that I wanted to get on the record.

18 CHAIRMAN BALLINGER: Well, in the true  
19 spirit of an MIT faculty meeting, we have used up  
20 all the available time in spite of the fact that  
21 we've nominally finished early on this. Can we, I  
22 think we should take a break for, till 25 of. And  
23 then for the next -- if that's okay.

24 We'll adjourn.

25 (Whereupon, the above-entitled matter

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1       went off the record at 10:20 a.m. and resumed at  
2       10:39 a.m.)

3                   CHAIRMAN BALLINGER:     Okay, we're back  
4       in session.

5                   Next up is the industry presentation.

6                   MR. GEIER:     Good morning.     I'm Steve  
7       Geier and I'm with NEI.     And we're here to talk  
8       about their industry perspective on the draft Reg  
9       Guide.

10                  And I'm just going to give some  
11       introductory remarks and then turn it over to  
12       really the industry experts.   We have Larry Naron  
13       here from Exelon for the BWR perspective and kind  
14       of overall; and then Wayne Harrison from STP, the  
15       pilot, the pilot plant.

16                  And basically, you know, from the NEI  
17       perspective, you know, when we look at a Reg Guide  
18       such as this we really want to ensure the  
19       information is provided to make sure it can be  
20       officially implemented without having the  
21       substantial consumption of resources.     Really  
22       looking at efficiency here and effectiveness.

23                  And we also want to make sure that it's  
24       appropriately written so that it will assist,  
25       assist the plant or at least not impact on the

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1 ability to close the issues and address the issues  
2 that they're using this, this risk-informed  
3 approach for.

4 And then just over all just a  
5 reemphasis, you know, on the efficiency standpoint  
6 is the industry does have several initiatives under  
7 way to ensure that we could be cost-effectively  
8 moving forward in resolving these issues  
9 implementing the regulatory guidance, such as  
10 cumulative effects of regulation, of course the  
11 NRC's own program Project Aim 2020, and then NEI's  
12 Delivering Nuclear Promise. We have several  
13 initiatives under way just looking at being as  
14 efficient as possible with the limited resources  
15 we have so that the plants can continue to  
16 be competitive, continue to be operating safely  
17 and reliably.

18 And with that I will turn it over to  
19 Larry Naron to give the industry perspective.

20 MR. NARON: Good morning, everybody.  
21 Thanks for having us here.

22 It has been an interesting discussion  
23 so far. And actually, a lot of the, a lot of the  
24 points I wanted to make have already been made.  
25 This slide, for instance, was just discussed. So I

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1 thought that that was a good discussion. Don't  
2 really have anything to add to that.

3 Although we didn't -- we touched on new  
4 plants a little bit in the discussion, but that,  
5 wanted to make sure that we brought that up that,  
6 you know, that may be interesting in new plants  
7 evolving for instance to use this approach.

8 Next slide.

9 MEMBER REMPE: Well, it was discussed.  
10 I think Professor Corradini mentioned that it  
11 doesn't address this. But since you're from the  
12 BWR industry what would you like to see done here?

13 MR. NARON: Well, what we looked at in  
14 reviewing this and from the BWR side was this  
15 guidance, did it preclude us from doing anything?  
16 Was it -- would we be able to take the guidance and  
17 would it help us to approach a risk-informed  
18 resolution for this if we chose. And we didn't see  
19 anything that precluded us from doing it. Although  
20 the question came up, I don't know of any BWRs  
21 right now that are intending to use this.

22 MEMBER REMPE: So you don't have any  
23 recommendations on what you would like to see done  
24 to improve it is what I'm hearing from you?

25 MR. NARON: You know, I'm going to touch

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1 on a couple. But in general there's some  
2 improvements that, you know, we feel could be made  
3 based if we started down, say a pilot would be  
4 develop -- be doing more.

5 MEMBER REMPE: Okay.

6 MR. NARON: So next slide.

7 There are, there were some prescriptive  
8 portions of the Reg Guide. For instance, we  
9 discussed earlier, you know, break location, can  
10 you screen just low frequencies. And the  
11 frequencies being sort of prescriptively pointed  
12 toward the arithmetic mean rather than geometric  
13 mean.

14 There is wording in there that will  
15 allow you to justify it. But, again, that would  
16 create more interaction, more time and resources to  
17 justify using other than the arithmetic mean. I  
18 thought that was too prescriptive.

19 Next slide.

20 And then there was some parts of the  
21 Reg Guide that weren't very prescriptive. And the  
22 threshold for reporting defense in depth and safety  
23 margin changes, for instance, you know, it left for  
24 interpretation that any change, however small,  
25 would be reportable. And I don't think that was

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1 the intent.

2 CHAIRMAN BALLINGER: That was a -- I  
3 think that was addressed at least nominally in the  
4 latest version; right? The reporting issues, the  
5 thresholds for reporting?

6 MR. NARON: It seemed still vague to me  
7 that I saw, if there was a change. I don't see it.

8 CHAIRMAN BALLINGER: Okay.

9 MR. W. HARRISON: And I would agree  
10 with what Larry is saying there. The threshold for  
11 reporting on defense in depth and safety margins,  
12 which are non-quantitative things that are being  
13 put in our application, I'm not sure if from a  
14 regulatory perspective how we would evaluate  
15 reporting degradation of defense in depth and  
16 safety margin with respect to, with respect to  
17 this.

18 Now, if we could, personally I would  
19 prefer to see, well, if you can quantify in some  
20 way an effect on the risk maybe that would be a  
21 better metric for use in reportability or doing  
22 report rather than these softer issues.

23 MR. NARON: And along the same lines,  
24 the 48-month update requirement that, having the  
25 requirement that's just calendar-driven rather

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1       than, you know, what changes have been made that  
2       would warrant updating. Again, updates are costly  
3       and to have it just driven by time doesn't seem  
4       appropriate.

5               Next slide.

6               MEMBER STETKAR: I'm just curious. If  
7       it were time-driven and you hadn't made any  
8       substantive changes, what would be involved in that  
9       update?

10              MR. NARON: And that, that was another  
11       comment that it's not clear what, you know, what  
12       the scope of an update would require.

13              MEMBER STETKAR: Yeah. It strikes me  
14       if nothing changed the update is the original one.

15              MR. W. HARRISON: I think I agree with  
16       what Larry's saying there. We'd probably like to  
17       have more dialog on this.

18              Oh, thank you. I didn't realize we had  
19       a button to push there.

20              I said we would probably like to have  
21       more dialog from the staff on that reporting.  
22       South Texas currently has an update -- excuse me,  
23       it's not on reporting but on the updates -- South  
24       Texas currently has a requirement in our updated  
25       final safety analysis report for updating that was

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1 based on our pilot exemption request that  
2 resembles the 50.69 special treatment requirements.

3 But if you read what's in the  
4 regulation for 50,69, it talks about updating as  
5 well but it doesn't have specific time limits for  
6 updating our requirements. So, you know, there's  
7 some, that was some precedent for that that we  
8 might refer back to.

9 MR. NARON: So there was a lot of  
10 discussion earlier about the inputs that are  
11 deterministic in nature such as strainer behavior,  
12 debris transport. And all of these I guess from  
13 our view introduces conservatism and it's  
14 cumulative. And the more that we add these  
15 conservatisms from the deterministic inputs, the  
16 further that we get away from realism.

17 So that's, that's a concern that we may  
18 be overstating the risk based on implementing the  
19 deterministic.

20 MEMBER STETKAR: Larry, let me pulse  
21 you on that because you've heard me talking about  
22 uncertainty and things like that. I, of course, in  
23 my comments was approaching the concept of  
24 uncertainty and not fully examining where those  
25 deterministic values are in the overall uncertainty

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1 distribution so that you better understand margins  
2 that may be available using those values.

3 Are you advocating the use of  
4 uncertainties throughout those analyses so that you  
5 understand if they are conservative, how  
6 conservative they are? Or are you advocating using  
7 different values? And if so, what different values  
8 do you use?

9 MR. NARON: I think the way I view it  
10 is in order to get, you know, take those  
11 conservatisms out it would take a lot of effort, a  
12 lot. And in order to get closer to realism with  
13 these inputs would be very, very difficult and  
14 costly. So it's more of a recognition that the  
15 more the deterministic inputs, the more the trying  
16 to refine, it just increases the cost, increases  
17 the resource. And at a certain point it makes --  
18 it's too complicated.

19 MEMBER STETKAR: Well, but I'm asking  
20 you what are you proposing as an alternative? I  
21 mean if you say, well, the deterministic inputs are  
22 too conservative and it requires a lot of effort to  
23 address the issue, given those deterministic  
24 inputs, what's the alternative? Do I use  
25 probabilistic inputs? And will that somehow

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1       simplify the effort and reduce conservatism, which  
2       is your concern?

3               MR. NARON:   And I guess this will come  
4       out of the pilot.   I don't really come here with a  
5       fix, more of a recognition that there will have to  
6       be worked through in order for this to be a useful  
7       approach.

8               MR. W. HARRISON:   I'll comment on this  
9       from a regulatory perspective.

10              The South Texas project started out  
11       with a detailed approach.   And after a while we  
12       determined that we would probably be better, better  
13       served with a simplified approach would be done in  
14       basically about a year ago.   And our simplified  
15       approach it isn't counting assessment, it's based  
16       on a successful test that we performed.   And then  
17       any break that generates more debris than we  
18       passed in that -- in any more fibrous, fine fiber  
19       debris than we passed in that test we assume goes  
20       to failure.   And then we apply NUREG-1829 break  
21       frequencies to determine what's the probability of  
22       generating that amount of debris that it sees what  
23       we tested.

24              So this is a, I would consider this a  
25       bounding risk assessment.   We don't use our PRA

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1 model to do this. We -- Laur talked about that.  
2 We, again, we look at how much debris is generated  
3 and what's the break size that generates that much  
4 debris, and applied NUREG-1829 to determine what  
5 that, what that is. That's our application of our  
6 PRA. Basically the only thing we're using our PRA  
7 for is to compare that risk to the -- our baseline  
8 risk in our PRA to see what region we are in Reg  
9 Guide 1.174.

10 So, we talked about do we intend to  
11 change the base PRA for this? And our purpose in  
12 doing this was to respond to generic letter  
13 2004-02 and assess the impact of risk on STP and  
14 to close that generic letter. And that was also  
15 part of this focus as a Reg Guide.

16 So we know, so we came up with a  
17 satisfactory calculation of risk which puts us in  
18 Region III. We used the geometric mean to do that.  
19 We're in Region II with the arithmetic mean. But  
20 we would not propose to change our base PRA.

21 And I think we talked about, this was  
22 discussed at some length a little bit ago. From a  
23 regulatory perspective and licensing perspective I  
24 don't, I look at this as a PRA calculation. But  
25 what we will do is put this process and this model

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1 and the assumptions that went into this evaluation  
2 into our updated final safety analysis report. So  
3 it's part of our licensing basis now, along with  
4 the exemptions that went along with it and the  
5 evaluation that was performed by the NRC.

6 So if we make a change to the plant,  
7 then we have to go back and look at what did we  
8 change in the UFSAR and are we still aligned,  
9 aligned with that. So it's not that we go back and  
10 look necessarily at the "PRA" and re-do the base  
11 PRA. We have to look and see how did we affect our  
12 licensing basis?

13 They may require us to go back and do  
14 some eval, PRA evaluations. But fundamentally it's  
15 how did we affect the licensing basis that we just  
16 implemented?

17 MEMBER SKILLMAN: Wayne, let me ask you  
18 to back up a slide, please, to six.

19 I think I understood what you just  
20 said. With the, with your SER the way it's written  
21 and with your PRA count with the GSI-191 subcount,  
22 if you'd like to call it that.

23 MR. W. HARRISON: Uh-huh.

24 MEMBER SKILLMAN: Do you have  
25 difficulty with reporting, which is C.8 of this.

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1 MR. W. HARRISON: Let me look at C.8.

2 MEMBER SKILLMAN: Yeah.

3 MR. W. HARRISON: Read it.

4 MEMBER SKILLMAN: I would think based  
5 on what you said, any change that you might find is  
6 pretty much the same process at your plant as you  
7 would have if you found a condition for which  
8 reporting was required. If you found yourself in a  
9 tech spec situation or you found yourself in an  
10 operability determination and said, Hey, we better  
11 -- we've got a 5072, a 5072 report, I know that  
12 you're people do that --

13 MR. W. HARRISON: That's correct.

14 MR. SKILLMAN: -- regularly. That's  
15 not an issue. Why wouldn't that be the same for  
16 this?

17 MR. W. HARRISON: We have in our  
18 application a proposed change to the technical  
19 specifications that have for emergency core coolant  
20 system and containment spray a debris-specific  
21 action for, well, a debris-specific action that if  
22 we identify a condition where there is more debris  
23 than what was evaluated in, in what we evaluated in  
24 this -- or in this analysis --

25 MEMBER SKILLMAN: The assumptions for

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1 those analyses.

2 MR. W. HARRISON: -- assumptions for  
3 those analyses, then we would be in a -- we would  
4 enter our technical specification.

5 And then we would follow our corrective  
6 action program and reporting process to determine,  
7 well, is that a reportable condition? How long  
8 were we there? Was it really inoperable? Do I  
9 have, do I have margins in my safety margins that  
10 account for that?

11 There's a, you know, there's a process  
12 that we accepted for doing that reportability for  
13 the effect of that debris.

14 MEMBER SKILLMAN: So it sounds like at  
15 least for your plant the proposed change to C.8 is  
16 of no real significance. That's not an increase in  
17 work; you would be doing that anyways?

18 MR. W. HARRISON: Well, I think what I  
19 was talking about back on C.8 is I'm not sure how  
20 in that process that we would address reduction in  
21 defense in depth or safety margin. Because that's  
22 not a -- that's a softer issue to address. I mean  
23 because it involves other, other equipment, maybe  
24 non-safety related equipment. And how long was  
25 that? And how does that really affect my safety

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1 margin? Does it make a significant effect?

2 I don't -- that's a new area for us to  
3 go into. We really haven't had much experience  
4 doing this.

5 MEMBER SKILLMAN: What I hear you  
6 saying is you're good with the concept of  
7 reporting. The difficulty is the metrics  
8 specifically for defense in depth and safety  
9 margin. It's the metrics that would cause you --

10 MR. W. HARRISON: Yes, sir, that's  
11 correct. That's a good way to say that.

12 MEMBER SKILLMAN: Okay, thank you.  
13 That helps. Thanks.

14 MR. W. HARRISON: And on the comments  
15 that I was making about the UFSAR and the licensing  
16 basis and the question on -- to me, that's a  
17 different question than what I would expect to see  
18 in the Regulatory Guide. I would not have expected  
19 C.J. to put that direction or that explanation in  
20 this regulatory guide. That's a different area.

21 MR. NARON: Okay, let's turn to the  
22 last slide now.

23 So in conclusion, you know, I pointed  
24 out some areas that could be enhanced, like the,  
25 feel like the Reg Guide when we looked at it from

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1 the plants, the pilot plants and some others that  
2 are looking at using this, we had them review it.  
3 And they felt that the guidance was useful and  
4 acceptable and could, they could continue the way  
5 they were going without any changes to the Reg  
6 Guide. Although it is, as we've discussed, kind of  
7 narrow in scope. It's focused on Reg Guide 191 for  
8 PWRs, existing PWRs.

9 And the other point that we discussed  
10 is that in allowing for flexibility it also would,  
11 could result in many different approaches which  
12 would take many, you know, more time to review and  
13 more resources on both sides, both staff and  
14 utility.

15 MR. W. HARRISON: From the pilot  
16 plant's perspective I agree with what Larry is  
17 saying. Our pilot application, the content of our  
18 pilot application lines up pretty well with what's  
19 in the Regulatory Guide. I think it does establish  
20 a process structure for the licensees and the staff  
21 to follow.

22 There was a lot of dialog from the ACRS  
23 subcommittee itself with respect to the specific  
24 requirements in that Regulatory Guide. And I would  
25 anticipate those same, that same kind of dialog to

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1 occur between the licensee and the staff in the  
2 implementation of that. So that doesn't -- we  
3 still need to resolve a number of those things,  
4 which will probably be done on that basis. But it  
5 still has us, I would say that it still has us  
6 talking about the right things to get us to where  
7 we need to be.

8 MR. NARON: Yeah, and I don't want to  
9 not recognize that the staff has worked with us in,  
10 you know, in creating this. And the pilot process  
11 is working. And the interaction we've had with the  
12 staff has been very constructive. And we would  
13 expect that to continue.

14 CHAIRMAN BALLINGER: Questions?

15 Can we get -- I understand that there  
16 are at least four people on the public line. So  
17 while we're waiting -- Oh, excuse me. Corradini  
18 first.

19 Is there anybody in the audience who  
20 would like to make a statement?

21 (No response.)

22 CHAIRMAN BALLINGER: Hearing none.

23 Are you there yet, Mike?

24 MEMBER CORRADINI: No. I just sent you  
25 a note.

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1 CHAIRMAN BALLINGER: Just sent me a  
2 note. You're talking.

3 MEMBER CORRADINI: Okay. You didn't  
4 acknowledge.

5 Let me ask the industry folks a  
6 question. So when I asked the staff about Appendix  
7 C and the fact that they had two additional things  
8 they were looking at which would be completed by  
9 the end of the calendar year, is it your feeling  
10 that some of the licensees want to move forward now  
11 and then wait on the Reg Guide to, what I'll say,  
12 give more realistic, realistic analysis, and  
13 Appendix C is not necessary and you want to move on  
14 this and get it published now?

15 What is the industry's view on that?

16 MR. W. HARRISON: This is Wayne  
17 Harrison speaking.

18 You know, we're the pilot and we're not  
19 depending upon the Reg Guide for our application.  
20 So I don't know that I can speak for the rest of  
21 the industry.

22 At some point I think there will be  
23 some other plants following on that need to refer  
24 to the Regulatory Guide. And I'm not sure when  
25 those, those applications will follow, whether they

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1 will follow after the rule or after the STP  
2 application is approved.

3 So schedule-wise, I see it's to their  
4 benefit to have a Regulatory Guide, to have more  
5 clarity. Besides the STP docketed information and  
6 the staff's safety evaluation I think, you know,  
7 the Reg Guide does provide an outline for that. So  
8 there is an advantage to having that in front of  
9 them as well.

10 MEMBER CORRADINI: Sure.

11 MR. W. HARRISON: But that's all I  
12 could say schedule-wise.

13 MEMBER CORRADINI: Well, what I'm  
14 interpreting you to say is sooner than -- sooner  
15 rather than later is good for industry at this  
16 point, even though there will be modifications to  
17 the Reg Guide?

18 MR. W. HARRISON: Yes, I think so.

19 MEMBER CORRADINI: Okay, thank you.

20 MR. GEIER: This is Steve Geier from  
21 NEI. Just to, you know, make a quick comment.

22 Gaining industry comments on this  
23 process I think, as you said, their being, they're  
24 the pilot and some of the plants are looking to  
25 follow on after that. But from an urgency

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1       standpoint, you know, we don't know of anybody  
2       that's waiting for additional guidance to really  
3       kind of fall into line behind the pilot project.

4               MR. W. HARRISON:     I believe that's  
5       correct.

6               MR. GEIER:     So again, sooner rather  
7       than later but, you know, it's not -- I think it's  
8       worthwhile to put this out on the street and then  
9       have the remainder follow up on that later this  
10      year.

11              CHAIRMAN BALLINGER:   Okay, is the other  
12      line open?   If you're, if anybody is out there on  
13      the line would you please identify yourself.

14              MR. KEY:     This is Ernie Key.     I'm  
15      representing the public.

16              And I just want to mention I have been  
17      involved for some time on this problem, as some of  
18      you know.   And one observation I'd like to kind of  
19      throw out because there's a lot of discussion about  
20      the relationship to the PRA of the risk that is  
21      evaluated -- and this is all in the public domain  
22      from the GSI-191 effort itself -- is that it's --  
23      the right way to think about what we call the risk  
24      would be an initiating event frequency as opposed  
25      to a, you know, like a basic event that shows up at

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1 the PRA.

2 That's the way the recent application  
3 is devised.

4 Then, secondly, there was a lot of  
5 discussion about uncertainty quantification. And  
6 we get that. And, again, as Wayne mentioned, we've  
7 attacked this from two perspectives. And we in the  
8 first approach had included large uncertainties,  
9 really long-tailed ones on several parameters. And  
10 we sampled those very carefully.

11 And I don't believe -- this is just my  
12 personal observation -- I don't believe that doing  
13 that exercise was as helpful as actually  
14 disclosing, looking at scenarios that you get out  
15 of the risk analysis. So South Texas looked at  
16 some scenarios that were informative. And others  
17 have found the same value.

18 So I think actually this, an approach  
19 that's not a classical uncertainty approach but is  
20 more along the lines of a classic probabilistic  
21 risk assessment approach where you tease out  
22 scenarios is helpful. And I don't think that's  
23 lost in anything in this Reg Guide.

24 And then, finally, there was discussion  
25 as to inclusion of the risk assessment in the PRA

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1 and how was that updated. And what we've found is  
2 that even with a simplified approach the magnitude  
3 of the risk is on the order of 10 to the minus 7.  
4 And in the more detailed approach it's even lower,  
5 like 10 to the minus 8.

6 So really the -- with a typical PRA CDF  
7 estimate of 10 to the minus 5th, this is very, very  
8 small compared to that.

9 So anyway, I think the risk analysis is  
10 capable, the way the Reg Guide is written, of  
11 revealing some weaknesses in the design. And we  
12 can -- and it's helpful in that regard.

13 Thank you.

14 CHAIRMAN BALLINGER: Thank you.

15 Anybody else out there?

16 (No response.)

17 Going once, twice. Done.

18 Thank you. Can we close that line?

19 MR. BLOSSOM: I've got a question.  
20 Should we correct the record? I mean Ernie's  
21 reading --

22 CHAIRMAN BALLINGER: Can you tell us  
23 who you are?

24 MR. BLOSSOM: Pardon me?

25 CHAIRMAN BALLINGER: Who are you?

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1 MR. BLOSSOM: Steve Blossom from South  
2 Texas.

3 CHAIRMAN BALLINGER: Get a little  
4 closer to your mike, sir.

5 MR. BLOSSOM: I was curious whether we  
6 should correct the record. Ernie's discussion,  
7 he's really not representing the public, he's  
8 representing industry. He might have called the  
9 wrong number or something like that, but he's, I  
10 don't know protocol-wise whether we should do that  
11 or it doesn't matter?

12 CHAIRMAN BALLINGER: It's on the record  
13 now.

14 MEMBER STETKAR: It's done.

15 (Laughter.)

16 MEMBER STETKAR: You will see that in  
17 writing, verbatim.

18 CHAIRMAN BALLINGER: Okay, so the line  
19 is closed. Can we go around the table and get  
20 comments from members, particular recommendations  
21 with respect to going forward? Dick?

22 MEMBER SKILLMAN: Yeah. I, let me be  
23 careful what I say here. I'm impressed at what I  
24 heard today.

25 What strikes me is, particularly from

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1 Steve Laur and from C.J. Fong, they were very clear  
2 in saying, hey, recognize that this is, this Reg  
3 Guide is pointing to a tool to quantify the risk  
4 simply of one little piece of GSI-191. It's the  
5 incremental risk from a break at a certain location  
6 for debris. It's not, this is not an all-  
7 encompassing, this Reg Guide is not intended to be  
8 an all-encompassing quantification tool. It's very  
9 surgically focused.

10 And once I began to understand that  
11 that's what those two gentleman were communicating  
12 I said to myself, okay, now this is like a small  
13 slide rule, a small piece looking at one very, very  
14 small segment of the overall PRA topic.

15 And so perhaps as we consider where  
16 we're going to go in the full meeting, if we can  
17 somehow make sure that the extent of applicability  
18 to what these changes mean and the instructions for  
19 how to make those changes from this Reg Guide, I  
20 would find that very helpful. Speaking as one  
21 member of the subcommittee.

22 Thank you.

23 CHAIRMAN BALLINGER: Dana?

24 MEMBER POWERS: No comment.

25 CHAIRMAN BALLINGER: Dennis?

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1                   MEMBER BLEY:     Yeah, just a couple  
2 things.

3                   I'm not as happy as I would have hoped  
4 I'd be at this point. It's cleaned up a lot since  
5 what we saw back in December; so I'm glad we waited  
6 to look at this.

7                   I kind of, I see where the staff points  
8 up in the main body the caveats and things that are  
9 important. I think the lack of specificity in the  
10 appendices is going to make the review process  
11 tougher. I would hope at some point they would  
12 revise this document to include that. I don't know  
13 that I would really push that it be done at this  
14 point.

15                  As they work on the alternative methods  
16 for Appendix C, I trust they will remember the  
17 discussions we had back in December. We haven't  
18 looked at that in a long time. And take advantage  
19 of what was said at that time.

20                  Otherwise that's all.

21                  CHAIRMAN BALLINGER: John.

22                  MEMBER STETKAR: Yeah. I asked a lot  
23 of questions and made a lot of statements. I kind  
24 of to tie things together would like to sort of  
25 summarize the three major points that I had.

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1           The first one, and I'll echo Dennis, is  
2           that I think that the Reg Guide suffers a bit from  
3           lack of clarity in terms of the expected scope of  
4           the assessments which would be performed. And I,  
5           you know, I gave the examples of bleed and feed,  
6           and steam line breaks, and we talked about seismic  
7           things. But making sure that both the applicant  
8           and the staff reviewers have a common understanding  
9           of the expectation of what should be addressed.

10           The second is this issue of "the PRA."  
11           And I will just use that term because in my  
12           simplistic mind there is "the PRA" for the plant,  
13           not 27 different PRAs. How, how would that PRA --  
14           what's the expectation for how that PRA or the  
15           information in that PRA, or however you want to  
16           characterize it, be used to support the simplified  
17           analysis in Appendix B?

18           And again, the thing that we've talked  
19           about a couple of times is would, after the  
20           analysis is completed, whether it's a simplified  
21           analysis or a detailed analysis, would that  
22           evaluation then become part of the PRA going  
23           forward as an assessment of the risk from debris?

24           And then the third issue is this whole  
25           discussion about how uncertainty is treated beyond

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1 just the uncertainty in the LOCA frequency,  
2 whichever, I don't care whether you use the  
3 arithmetic aggregation approach or the geometric  
4 mean aggregation approach, it's clear that I have  
5 to pluck some numbers for those frequencies.

6 But how is the uncertainty in the so-  
7 called deterministic consensus methods for debris  
8 generation, transport deposition, and phenomena  
9 addressed as part of the risk-informed decision  
10 making process? Either quantitatively or  
11 qualitatively, what sort of guidance is there for  
12 making sure that people also address the  
13 uncertainty in those so-called deterministic  
14 analyses?

15 So those are my three big ones.

16 CHAIRMAN BALLINGER: Joy.

17 MEMBER REMPE: I don't have any  
18 specific. Although there are a couple points that  
19 I did want to mention.

20 One, several of my colleagues during  
21 the discussion today there were several places  
22 where some additional clarification, and I believe  
23 the staff agreed that, well, maybe we could add  
24 those things in. I'd like to encourage the staff  
25 to do that and let us know that before the full

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1 committee meeting or at the full committee meeting.

2 But I guess I'm most persuaded by  
3 industry saying, well, I mean we've talked today  
4 about, yeah, it could be improved upon, but yeah,  
5 go ahead and put it out on the street. Because  
6 that was my question, why don't you just wait  
7 because it doesn't sound like he was using it right  
8 away. But if industry thinks it might help and the  
9 staff have said, yeah, there's good stuff in this  
10 Reg Guide to go ahead and put it on out, I'm kind  
11 of persuaded, yeah, probably it should go ahead and  
12 be released. But I hope that is adjusted.

13 CHAIRMAN BALLINGER: Mike Corradini,  
14 are you still pliable up there? We're working on  
15 it.

16 MEMBER CORRADINI: Hello.

17 CHAIRMAN BALLINGER: Hello.

18 MEMBER CORRADINI: You can hear me now?

19 CHAIRMAN BALLINGER: Yes, we can.

20 MEMBER CORRADINI: Okay. So I guess I  
21 heard all the comments of the members. And Joy  
22 actually brought up the one about, I'll use the  
23 provocative way of saying it, I'm not sure what the  
24 rush is. I'm hearing that the guide is really  
25 probably not going to be used by the BWR community

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1 because they don't, they don't have anything that  
2 needs to be solved at this point.

3 I'm hearing that on the PWR side,  
4 although it would be good to get it out now, staff  
5 is going through and is going to, I will say, put a  
6 more complete Appendix C out for consideration.  
7 And in that time period I'm not sure what's going  
8 to be used, what this will be used for. So I'm not  
9 sure what the rush is.

10 The other thing is -- and I thought  
11 Dana was going to bring it up -- I still sense that  
12 Dana is looking for a completeness discussion about  
13 what have we thought about and has been discarded  
14 just so at least for the moment we understand  
15 what's complete. And the one thing he mentioned  
16 was chemistry effects induced by radiation.

17 And I'm curious if the South Texas  
18 people have been asked that and considered it and  
19 then disposed of it. But I think the completeness  
20 part of this is missing.

21 So if staff and industry want to see  
22 this out on the street, that's fine. But I sense  
23 we're going to be back here talking about this  
24 again.

25 That's it for me.

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1 CHAIRMAN BALLINGER: Thank you. That's  
2 actually a good lead-in because to sort of open the  
3 question to the staff is, is it time to go to the  
4 full committee? Given what you've heard so far and  
5 what would likely appear in a letter basically  
6 going to the full committee, is this the time to do  
7 that?

8 MR. FONG: That's our position, yes.

9 CHAIRMAN BALLINGER: Simple enough.  
10 Simple enough. Thank you. I guess --

11 MEMBER POWERS: It would be a  
12 relatively complicated letter to write. But I  
13 don't think there would be any -- I don't think it  
14 would be an impossible letter to write.

15 CHAIRMAN BALLINGER: Impossible --  
16 Never mind.

17 Okay, thank you. With that I think, if  
18 there aren't any other questions or comments we are  
19 adjourned.

20 MEMBER BLEY: Let me speak on that.  
21 Oh, you already said it.

22 MEMBER POWERS: No, he didn't bang the  
23 gavel.

24 MEMBER BLEY: He didn't bang the gavel.

25 I would hope at a full committee

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1 meeting the staff would explain to the full  
2 committee the issue Mike raised about what's the  
3 rush and why, why is it best to do it now in a  
4 little more detail that you have today.

5 MEMBER POWERS: It seems to me that a  
6 lot of the concern arose because you have South  
7 Texas being a pilot, which is a distinct plant with  
8 features peculiar to themselves. And you say, gee,  
9 how does this extrapolate on? Well, there's no  
10 better opportunity to find out how it extrapolates  
11 on than have other people use it.

12 So I mean I think that almost answers  
13 itself by saying, okay, we've got this thing. It's  
14 not as complete as we'd like but it's useful. And  
15 the only way we're going to know how to guide our  
16 further completion on this is to have more people  
17 use it.

18 MEMBER BLEY: I wouldn't disagree with  
19 that at all except nobody is standing in line.

20 MEMBER POWERS: I don't think so.

21 But maybe this is a peculiar  
22 opportunity that the staff has to actually be well  
23 ahead of the game here and to guide their  
24 subsequent work on the other alternatives, based on  
25 what they episodically learn.

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1 MR. FONG: Can I add one comment to  
2 that, Mr. Chairman?

3 CHAIRMAN BALLINGER: Sure.

4 MR. FONG: There are several licensees  
5 in the queue, so to speak, to use this method. And  
6 we expect, based on a draft schedule I was  
7 provided, to review several of these in calendar  
8 year 2016. So that there are other licensees, not  
9 on the docket yet, but have told us, hey, we're  
10 coming in in 2016, we want to use the risk-informed  
11 method.

12 CHAIRMAN BALLINGER: But with regard to  
13 the advice to the staff for the full committee,  
14 should really go after these questions.

15 MR. FONG: Oh, of course. Absolutely.

16 And the other thing I'd add is that the  
17 Commission's expectation on, the policy I should  
18 say on the cumulative effects of regulation, guide  
19 the staff to release implementation guidance like  
20 Reg Guides for public use when the rule goes out.  
21 So we've got a Rule 5046c that's going to the  
22 Commission very soon.

23 CHAIRMAN BALLINGER: Has it gone up  
24 yet?

25 MR. FONG: Not with the Commission.

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1 CHAIRMAN BALLINGER: Okay.

2 MR. FONG: It's now with SECY. And so  
3 we'd like to get the guidance necessary for folks  
4 to use that rule out on the street.

5 CHAIRMAN BALLINGER: Thank you.

6 Try number two. Okay, absent any other  
7 comments, we are adjourned until I think 1:00  
8 o'clock. Oh, we're adjourned. There's another  
9 meeting going on.

10 So this subcommittee is adjourned.

11 (Whereupon, at 11:24 a.m., the  
12 subcommittee was adjourned.)  
13  
14  
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# **Regulatory Guide 1.229**

## **Risk-Informed Approach for Addressing the Effects of Debris on Post-Accident Long-Term Core Cooling**

**Advisory Committee on Reactor Safeguards**  
**March 22, 2016**

Steve Laur, CJ Fong  
Division of Risk Assessment  
Steve Smith, Division of Safety Systems  
Office of Nuclear Reactor Regulation

# Objectives

1. Provide status of RG
2. Describe changes made subsequent to November 4, 2015 subcommittee meeting
3. Clarify difference between detailed approach (Appendix A) and simplified approach (Appendix B)

# Status

- During November 2015 subcommittee meeting, RG 1.229 was still undergoing inter-office concurrence
- Substantive and editorial changes were made in response to feedback during concurrence process and minor changes to the rule itself
- Final concurrence and OGC no legal objection received on 2/8/2016
- Concurrence version of RG transmitted to ACRS subcommittee on 2/23/2016
- Staff believes RG is ready for use

# **Change to rule led to a minor change to the RG**

*(Discussed during February 4, 2016 full ACRS meeting)*

- Rule language changed to clarify that *some (not all)* changes to methods require NRC approval
- Conforming change made to RG 1.229 Section C.9 requiring that the specific methods be identified

# Insights gained from concurrency process

November 2015 version of RG 1.229 Appendix C contained three methods for allocating plant wide LOCA frequency onto specific break locations:

1. Bounding
2. Conservative Partitioning
3. Semi-Quantitative Partitioning



# Changes to Appendix C

- Methods 2 and 3 were removed due to comments received during concurrence
  - Deemed to “have merit” but not ready for regulatory use
- Version discussed during December 2015 full ACRS meeting retained only the bounding method (“method 1”)

## **Appendix C, Path Forward**

- RG 1.229 is ready for use now (concurrence has been achieved)
- Bounding method in Appendix C is suitable for pilot based on staff confirmatory calculations
- Staff will evaluate pilot experience and revise RG 1.229
- Staff currently developing additional LOCA frequency allocation methods for revised RG

# **Future revisions to Appendix C**

- NRR, RES senior management met on 2/8/16; agreed to augment Appendix C with more realistic methods
- Project plan has been developed
- Key RES and NRR staff identified
- Target completion: late 2016 / early 2017

# Detailed Approach (Appendix A)

- New strainer/core failure basic events added to PRA model
- Phenomenological model to estimate failure probabilities for those basic events
  - Debris generation and transport
  - Impact on strainers and core
  - Considers scenario-based parameter differences

# **Simplified Approach (Appendix B)**

- “Go/no-go” debris threshold based on test
- LOCA sizes/locations compared to criteria
  - CCDP = 0.0 if debris generated & transported < threshold
  - CCDP = 1.0 otherwise

# Conclusion

- RG 1.229 has completed concurrence process
- RG relies on existing, proven framework (RG 1.174, RG 1.82, NEI-04-07)
- Staff believes RG ready for use (based on STP pilot)
- Staff is developing additional methods for use in a future version of Appendix C

# Industry Perspective on Draft RG 1.229

**Stephen Geier**

Senior Project Manager, Nuclear Energy Institute

**ACRS Subcommittee on Metallurgy and Reactor Fuels**

**MARCH 22, 2016**

**Rockville, MD**

# NEI Perspective

- Introductory Remarks
- Ensure information is provided for efficient implementation substantial consumption of resources
- Assist in resolution of issues affecting PWRs and BWRs
- Need exists to maximize efficient implementation in concert with programs focused on improving efficiency:
  - NEI 'Cumulative Effects of Regulation Project'
  - NRC 'Project AIM 2020'
  - NEI 'Delivering the Nuclear Promise'



# Industry Perspective on Draft RG 1.229

**Larry Naron**

Senior Manager-Exelon Risk Management  
Vice Chairman-BWROG IRIR Committee

## **RISK-INFORMED APPROACH FOR ADDRESSING THE EFFECTS OF DEBRIS ON POSTACCIDENT LONG-TERM CORE COOLING**

MARCH 22, 2016, ROCKVILLE, MD

# Industry Perspective on Draft RG 1.229

## High Level Generic Observations

- Introduction section notes the purpose is to present acceptable methods for addressing 10 CFR 50.46c “...effects of debris on long-term cooling”
- RG is almost exclusively tailored to resolving GSI-191 for existing PWR plants.
  - Silent on New Plants or BWR’s

# Industry Perspective on Draft RG 1.229

## High Level Generic Observations

- RG is prescriptive in some areas -likely requiring significant interaction between the licensee and staff reviewers
  - C.1.b“...no break location or LOCA scenario should be screened from the analysis strictly due to its assumed low frequency of occurrence”
  - C.2.b“...NUREG -1829 frequencies determined using arithmetic or mixed distribution is acceptable”

# Industry Perspective on Draft RG 1.229

## High Level Generic Observations

- RG is vague in some areas -likely requiring significant interaction between the licensee and staff reviewers
  - C.7 Scope and content of required 48 month update
  - C.8 Threshold for reporting reduction of defense in depth or safety margin

# Industry Perspective on Draft RG 1.229

## Risk Informed Culture

- Use of deterministic input to risk informed regulation has been problematic
  - RG requires deterministic input such as strainer behavior, debris transport, and chemical effects
  - This likely introduces conservatisms which are cumulative

# Industry Perspective on Draft RG 1.229

## Conclusion

- Effectively describes two acceptable approaches to addressing debris
- Is useful in identifying salient focal areas for analysis
- Is somewhat narrow in scope
- Allows flexibility, but may result in varied approaches increasing preparation and review resources