

# **Official Transcript of Proceedings**

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION  
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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
(ACRS)  
+ + + + +  
FUTURE PLANT DESIGNS SUBCOMMITTEE  
+ + + + +  
MONDAY  
SEPTEMBER 20, 2021  
+ + + + +

The Subcommittee met via Videoconference,  
at 9:30 a.m. EDT, Dennis Bley, Subcommittee Chair,  
presiding.

COMMITTEE MEMBERS:

MATTHEW W. SUNSERI, Chairman  
JOY L. REMPE, Vice Chairman  
RONALD G. BALLINGER, Member  
VICKI M. BIER, Member  
DENNIS BLEY, Member  
CHARLES H. BROWN, JR. Member  
VESNA B. DIMITRIJEVIC, Member  
GREGORY H. HALNON, Member  
JOSE MARCH-LEUBA, Member  
DAVID A. PETTI, Member

DESIGNATED FEDERAL OFFICIAL:

Derek A. Widmayer

ALSO PRESENT:

Victoria Anderson, NER

Keith Compton, RES

Karl Fleming, JCNRM

Anders Gilbertson, RES

Michelle Gonzalez, RES

Dennis Henneke, JCNRM

Hanh Phan, NRR

Mehdi Reisi-Fard, RES

Marty Stutzke, NRR

Shilp Vasavada, NRR

Donna Williams, NRR

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

9:32 a.m.

MEMBER BLEY: Good morning, everyone, the meeting will now come to order. This is a meeting of the Advisory Committee on Reactor Safeguards Subcommittee on Future Plant Designs. I'm Dennis Bley, chairing this Subcommittee meeting.

ACRS Members in attendance as of the last time I looked are Ron Ballinger, Charlie Brown, Vesna Dmitrijevic, Greg Halnon, Jose March-Leuba, Dave Petty, Joy Rempe, and Matt Sunseri.

If anybody else has come on let me know.

MEMBER BIER: Dennis, I just joined.

MEMBER BLEY: Thank you, Vicki. So, we have almost a full house of members, I don't see Walt yet. He's probably gone, he is gone. Derek Widmayer of the ACRS Staff is the designated federal official for this meeting.

The purpose of today's meeting is to discuss the draft regulatory guide 1.247, exceptability of probabilistic risk assessment results for advanced Non-Light Water Reactors risk-informed activities, which says that it endorses with exceptions and clarifications the non-LWR PRA standard, ASME-ANS, RA-S-1.42021.

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1           Actually, the text of the reg guide lists  
2 no exceptions, it does list qualifications and  
3 clarifications. Before we begin, I want to raise a  
4 few issues for the Staff and for Members to consider  
5 today.

6           I had anticipated that the Staff would  
7 want a letter at this time but after noting that the  
8 Reg Guide states that it describes one trial approach  
9 and after seeing a very large number of qualifications  
10 and clarifications, I wonder if a letter would be more  
11 appropriate after revisions to the standard reg guide  
12 occurs.

13           The Staff and representatives of the  
14 Standards Committee are invited to comment on this  
15 question during their presentations.

16           We will poll the Subcommittee near the  
17 close of the meeting to determine the Members'  
18 opinions on the need for a letter at this time.

19           The reg guide is structured much like Reg  
20 Guide 1.200, exceptability of PRA results for  
21 risk-informed activities, however, I notice the  
22 discussion in Part C that very thoroughly describes an  
23 acceptable PRA differs quite a bit from the specific  
24 line in Reg Guide 1.200.

25           I would have expected the new reg guide to

1 refer to 1.200 for most or all of the extensive  
2 descriptive information.

3 I'm not sure why it didn't, I'm also not  
4 sure why the text is so different and I wonder if the  
5 Staff intends to revise 1.200 to match this new  
6 language.

7 Maybe the Staff can comment on that when  
8 they're giving their presentations as well.

9 Finally, this Committee has written to the  
10 Staff on several occasions about the importance of  
11 conducting the search for initiating events and  
12 associated scenarios for new designs without pre-  
13 conceptions, using a structured approach to enhance  
14 the thermos of the search.

15 Of course, after a list of initiating  
16 events is developed, it makes sense to compare it with  
17 lists developed for current LWRs and even other  
18 industries to look for possible omissions that should  
19 be picked up.

20 The current version of the standard does,  
21 in my opinion, a nice job of stating the requirements  
22 for a structured search and its supporting  
23 requirements, IE-A1, 2, 5, 6, 9, 12, 16 and 17.

24 Also, the explanatory, non-mandatory  
25 Appendix IE provides help on how to conduct the search

1 and includes elements that should enhance the rigor of  
2 the search, including IE-N-1, 2, 8 to 17, 20, 23 to  
3 26, 28, and 32 to 34.

4 It was surprising, at least to me, that  
5 the Staff had no clarifications on any of these  
6 supporting requirements or explanatory notes. It was  
7 rather than disappointing that the Staff had no  
8 comments on the importance of starting this search  
9 with a blank sheet of paper.

10 When there's ample research demonstrating  
11 the study within an existing list creates significant  
12 anchoring bias. The temptation is to start with the  
13 existing list and remove events that do not apply to  
14 the new design.

15 Today the Subcommittee will gather  
16 information, analyze relevant issues and facts, and  
17 formulate proposed positions and actions as  
18 appropriate.

19 This matter is scheduled for our October  
20 full Committee meeting at which time the Committee may  
21 develop a letter report on the Reg Guide to transmit  
22 to the Staff.

23 The ACRS was established by statute and is  
24 governed by the Federal Advisory Committee Act, FACA.  
25 The NRC implements FACA in accordance with its



1 regulations found in Title 10 of the Code of Federal  
2 Regulations Part 7.

3 The Committee can only speak to its  
4 published letter reports. We hold these meetings to  
5 gather information and perform preparatory work that  
6 will support our deliberations at a full Committee  
7 meeting.

8 The rules for participation in all ACRS  
9 meetings including today's were announced in the  
10 Federal Register on June 13, 2019.

11 The ACRS Section of the NRC public website  
12 provides our charter, bylaws, agendas, letter reports,  
13 and full transcripts of all full and Subcommittee  
14 meetings including the slides presented at those  
15 meetings.

16 The meeting notice and agenda for this  
17 meeting were posted there.

18 As stated in the Federal Register notice  
19 and in the public meeting notice posted to the  
20 website, members of the public who desire to provide  
21 written or oral input to the Subcommittee may do so  
22 and should contact the designated federal official  
23 five days prior to the meeting as practicable.

24 Today's meeting is open to public  
25 attendance and we have received one request to make an

1 oral statement from the Victoria Anderson at NER.  
2 Time has also provided an agenda after the  
3 presentations are complete for this oral statement or  
4 for spontaneous comments for members of the public  
5 attending or listening to our meetings.

6 Today's meeting is being held over  
7 Microsoft Teams, which includes a telephone bridge  
8 line allowing participation of the public by Teams or  
9 by phone.

10 A transcript of today's meeting is being  
11 kept, therefore, we request that meeting participants  
12 on Teams and the bridge line identify themselves when  
13 they speak and to speak with sufficient clarity and  
14 volume that they can be readily heard.

15 Likewise, we request that meeting  
16 participants keep their computer and telephone lines  
17 on mute when not speaking to minimize disruptions. At  
18 this time I ask the Teams attendees make sure they are  
19 muted so we can commence the meeting.

20 We will now proceed. I will call on Mehdi  
21 Reisi-Fard, Branch Chief of the Performance and  
22 Reliability Branch of the Office of Research for  
23 opening remarks.

24 Mr. Fard?

25 MR. REISI-FARD: Good morning, was someone

1 saying something?

2 MEMBER BLEY: No, go ahead.

3 MR. REISI-FARD: Good morning, my name is  
4 Mehdi Reisi-Fard, I'm the Branch Chief of the  
5 Performance and Reliability Branch of the Office of  
6 Nuclear Regulatory Research.

7 First of all, I want to thank the  
8 Committee for the opportunity to present on the draft  
9 of reg guide 1.247, which is the guidance and  
10 acceptability of PRA results for advanced Non-Light  
11 Water Reactors risk-informed activities.

12 As you'll hear today in the Staff  
13 presentation, we believe this guidance will be a  
14 critical element in applying PRA information and  
15 risk-informed approaches in our regulatory activities  
16 related to Non-Light Water Reactors.

17 I'll start by highlighting a few points  
18 about the driver behind the Non-Light Water Reactors  
19 PRA acceptability project.

20 The organization and execution of the  
21 Staff's efforts to develop and publish Reg Guide 1.247  
22 has been a substantial and unprecedented undertaking  
23 given the timeframes the NRC committed to meet.

24 In January of 2019, the nuclear energy  
25 innovation and modernization act known as NEMA was

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1 signed into law, which created a driving force for the  
2 NRC to prepare for anticipated new applications for  
3 advanced reactors.

4 Prior to NEMA, the Staff had no near-term  
5 plans to endorse a consensus standard for Non-Light  
6 Water Reactors PRA.

7 However, NEMA accelerated the need for the  
8 standard development organizations to publish and for  
9 the NRC Staff to endorse the consensus standard for  
10 non-LWR PRAs.

11 So, the Staff had to organize and plan for  
12 their efforts relatively quickly in anticipation of  
13 the publication of the PRA standard.

14 Besides the accelerated schedule, another  
15 unique aspect or challenge related to the standard  
16 endorsement is that the scope of this standard is  
17 broader than any previously considered or endorsed  
18 consensus standard for PRA.

19 The scope includes all radiological  
20 sources, all hazards, all plant operating states, and  
21 all levels of analysis.

22 Because of their relationship between the  
23 Non-Light Water Reactors and related Light Water  
24 Reactors PRA standards and because the Staff  
25 anticipates endorsing the future Light Water Reactors

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1 PRA standards, the Staff recognized early the need to  
2 ensure that the Staff positions on the Non-Light Water  
3 Reactors PRA standard would be consistent with  
4 anticipated future endorsement.

5 Let me close by saying a few words about  
6 the Staff's efforts so far. As I stated earlier, the  
7 Staff needed to develop an aggressive schedule to  
8 issue this guidance.

9 Staff have achieved key project milestones  
10 with little deviation from the overall project  
11 schedule and our currently on track to meet the final  
12 publication deadline, which is the end of this  
13 calendar year.

14 Developing this guidance required  
15 extensive coordination across different groups to  
16 develop a unified Staff position with a consistent  
17 narrative.

18 Given the NRC's completion schedule and  
19 the complexity of the project, many of the next steps  
20 of the publication process including this briefing are  
21 being performed in parallel.

22 As such, the Staff will keep  
23 decision-makers apprised of any actionable feedback  
24 or potential changes the Staff may implement in  
25 response to such feedback.

1           And the internal concurrence review  
2 process will be somewhat dynamic. With that, I  
3 conclude my opening remarks. We very much appreciate  
4 this opportunity today and we look forward to your  
5 comments.

6           MEMBER BLEY: Before you turn it to  
7 someone else to continue the presentation, to the  
8 point I raised in the opening, I was kind of surprised  
9 by the sheer number of qualifications and  
10 clarifications in the Reg Guide.

11           And I wonder if the standards, people were  
12 also surprised, they'll get a chance to speak later.  
13 But do you anticipate there will be another round of  
14 possible changes to this standard and a reissue of  
15 this document?

16           To me most of those were important  
17 clarifications but there were no exceptions to the  
18 standard. If you can say anything on that it would  
19 help, or would you prefer that we just write a letter  
20 on the current version as it is?

21           MR. REISI-FARD: I'm sure the Staff will  
22 get into more discussion on this but very briefly, and  
23 folks from the team can weigh in if needed, there are  
24 plans in the future for the JCRM to revise or issue a  
25 new revision of the standard.

1           The current endorsement effort is going to  
2       be strictly on what is published so it seems like  
3       we're going to move forward with the current version  
4       of this standard and the current draft guidance.

5           As I said in the future, there may be some  
6       revisions to the standard.

7           MEMBER BLEY: We look forward to hearing  
8       what the Staff and Members of the standards group have  
9       to say later. I guess that's enough, thank you very  
10      much. You can turn it over to your first speaker, if  
11      you would.

12          MR. REISI-FARD: Our next speaker is  
13      Michelle Gonzalez. Michelle, please take it away.

14          MEMBER BROWN: Dennis, before that starts,  
15      this is Charlie, could I ask as a non-PRA expert --

16          MEMBER BLEY: You can ask it as a human  
17      being of any sort.

18          MEMBER BROWN: That's precisely how I'm  
19      asking it. So, if I'm way off base...Why is the PRA  
20      for a Non-Light Water Reactors different from a Light  
21      Water Reactor? I thought a PRA was somewhat  
22      technology-neutral.

23          MEMBER BLEY: That's addressed to the  
24      Staff?

25          MEMBER BROWN: Yes, that's addressed to

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1 the Staff. I saw the stuff you were talking about,  
2 Dennis, the clarifications, and I'm just wondering why  
3 in the world we even have a different standard for  
4 non-LWRs?

5 That's why I wanted to at least ask that  
6 and get it out of the way early.

7 MEMBER BLEY: Let's return to this toward  
8 the end if the presentations don't address it to your  
9 satisfaction.

10 MEMBER BROWN: That's fine.

11 MEMBER BLEY: Anybody else, Members? With  
12 this, we'll turn it over Michelle Gonzalez. Michelle?

13 MS. GONZALEZ: Good morning, Dr. Bley,  
14 I'll take a first shot on that question and I know the  
15 rest of the presenters will go into more into that.

16 But one of the main differences of this  
17 standard that it covers all operating phases so there  
18 is pretty much a good distinction in the requirements.

19 For pre-operational phases, operational  
20 phases, that's one of the main differences on why we  
21 would need a different reg guide and a different  
22 standard for the advanced NLWR fleet.

23 MEMBER BROWN: So, operational phases mean  
24 not just operation but decommissioning as well as  
25 building or maintenance or what? I guess I didn't

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1 realize existing PRAs weren't as far-reaching based on  
2 all the meetings I've been participating in.

3 MS. GONZALEZ: Reg Guide 1.200, which is  
4 for the LWR cover-only operational phases, and I'm  
5 sorry to defer this, Anders, if you could provide  
6 additional guidance on this --

7 MEMBER BROWN: That's fine, I was just  
8 curious. Thank you, I appreciate it.

9 MS. GONZALEZ: You're welcome. So, I will  
10 start off with my presentation. Donna, if you can  
11 just slide one back -- yes, that one.

12 So, good morning, I am Michelle Gonzalez,  
13 I am a risk and reliability analyst from the office of  
14 regulatory research, Division of risk analysis and I'm  
15 one of the research technical leads on the development  
16 of the reg guide.

17 The way that this briefing is going to be  
18 organized, I'll first go over some of the background  
19 information providing some updates since our last  
20 briefing the last year.

21 Then Anders Gilbertson will discuss the  
22 approach of developing Reg Guide 1.247, providing a  
23 discussion on the approach of this reg guide versus Re  
24 Guide 1.200.

25 Hanh Phan and Marty Stutzke, both from

1 NRR, will discuss the scope of reg guide and the staff  
2 position, discussing some of the most important issues  
3 that were identified for endorsement.

4 The JCNr representatives, Dennis Henneke,  
5 Karl Fleming, will provide their feedback on Reg Guide  
6 1.247 and will discuss future plans for the non-LWR  
7 PRA standard.

8 So, then Donna Williams, she's the Project  
9 Manager from NRR, she will close out the briefing with  
10 a brief discussion on the next steps of finalizing Reg  
11 Guide 1.247 and the upcoming plans for stakeholder  
12 engagement.

13 Next slide, please, Donna.

14 MEMBER BLEY: Could you tell us what slide  
15 number you're on since it's not showing up on the  
16 screen?

17 MS. GONZALEZ: Slide 4.

18 MEMBER BLEY: Thank you.

19 MS. GONZALEZ: The advanced non-LWR PRA  
20 standard was initially issued by ASME in 2013 as the  
21 trial use standard. Lessons learned from the bylaw  
22 applications were used to improve the standard, which  
23 was initially validated in May of 2020.

24 The NRC was involved in the validating  
25 process, reviewing the standard and providing comments

1 to the JCNRM at that point.

2 MEMBER BLEY: Michelle? This was issued,  
3 as you say, eight years ago for trial use and I think  
4 it's had some trial use. Why is the current reg guide  
5 still a trial use reg guide?

6 MS. GONZALEZ: I will discuss it a little  
7 bit further but we were discussing different options  
8 on how we could endorse these standards in order to  
9 meet the deadlines that we needed for upcoming  
10 licensees and that part.

11 So, once of the ways we could do this and  
12 in order to be able to -- I guess, in the next couple  
13 of years we issued it now as a trial reg guide and we  
14 can include other things if the JCNRM decide that  
15 they're going to be updating the standard.

16 We can include Part 53, things are ongoing  
17 now and we will issue a final reg guide in the next  
18 couple of years.

19 In February of 2021, the final version of  
20 the standard was released and it is important to note  
21 here, and I know that Maricova did, but this standard  
22 is very unique.

23 It is meant to be technology- inclusive,  
24 it covers all levels of analysis from initiating  
25 events to radiological consequences. It covers all

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1 hazards, internal and external, and all operating  
2 modes except for low-PRA shutdown types of POSs for  
3 internal fire.

4 MEMBER BLEY: Can I interrupt you again?  
5 I'm sorry, this is for Charlie. Charlie, what  
6 happened with the LWR standard is it came out  
7 piecemeal.

8 First, there was the one for operations at  
9 power and there have been for internal events that  
10 power, then there have been new ones kicked out for  
11 external events and for shutdown conditions and  
12 others.

13 So, the current one we're looking at today  
14 is trying to do all that in one package and I think  
15 that's correct. Michelle, go ahead.

16 MEMBER BROWN: Thank you, Dennis.

17 MS. GONZALEZ: It also covers elements  
18 that have not been endorsed yet by any other reg  
19 guides. Some of this is the element for risk  
20 integration and mechanistic source terms.

21 For these new elements, we're basically  
22 just setting up the stage for future plans for  
23 endorsements on our part.

24 So, also, the technical requirements in  
25 the standard apply to different licensing phases from

1 the design, pre-operational, and operational phases.

2 Slide 5, please.

3 MEMBER BALLINGER: This is Ron. I'm  
4 following the talk with the slides that were sent out  
5 by email but I don't see slides on your screen.

6 MEMBER BLEY: I think just follow the  
7 other ones if you can, Ron. Four or five of us can't  
8 see it, the rest of us see it just fine. I think  
9 we're going to fix that on the fly.

10 MEMBER BROWN: I don't see them either,  
11 Dennis, so I'm one of the non-viewers.

12 MEMBER BALLINGER: I got that, Charlie.

13 MS. GONZALEZ: For your reference, I'm on  
14 Slide 5 now. So, we met last year with the ACRS on  
15 this topic on November 2nd. In that briefing we  
16 talked about the NRC endorsement plans and provided a  
17 summary of the valid results.

18 There has been a lot of progress since  
19 that briefing. In January the Staff issued a draft  
20 white paper to provide NRC views and perspectives on  
21 the non-LWR PRA standard.

22 This paper is publicly available and can  
23 be accessed in ADAMS with the number that's referenced  
24 here.

25 I will go into more details on the paper

1 in the next slide. Also, during the course of the  
2 year, we have several interactions with NEI where we  
3 were able to provide some comments on NEI 2009, which  
4 is in the PRA review guidance for non-LWRs.

5 Following those interactions, the NRC  
6 received an updated version of NEI 2009 in May of  
7 2021. The previous issue and prior use reg guide, Reg  
8 Guide 1.247, was made publicly available on September  
9 7th and I just want to note here that this is the same  
10 version that we sent out to the ACRS.

11 This vision was sent to them for review  
12 and the review was completed, this was Friday. So, we  
13 know this version has some internal issues, typos, and  
14 formatting things that will be fixed now that we have  
15 the QT revised version back.

16 Slide 6, as I mentioned on the previous  
17 slide, the steps of the draft white paper, the title  
18 is Demonstrating the Acceptability of Pra Results Used  
19 to Support Advanced Non-LWR Plan Licensing.

20 The main purpose of this paper was to  
21 provide early feedback on the staff views and  
22 perspectives on the non-LWR PRA standard.

23 This was done as a way of facilitating  
24 early communications with stakeholders on the issues  
25 that would be addressed in Reg Guide 1.247, allowing

1 for some additional opportunities for the public to  
2 provide feedback to the NRC on these issues.

3 We held a public meeting on February 23rd  
4 to discuss the white paper and received some feedback  
5 from the industry and from NEI so the comments that we  
6 received in that interaction were considered during  
7 the development of the trial use reg guide.

8 After various discuss, the Staff agreed  
9 that some of the issues that were identified in the  
10 white paper would be better addressed separately in  
11 other Staff guidance, like for instance, ISGs or some  
12 of the issues were require additional work or research  
13 we completed.

14 And I know that Marty will provide  
15 additional details on these issues later on in his  
16 presentation. Slide 7, please. So, in our last  
17 briefing to ACRS, we were still discussing the options  
18 for endorsement of the standard.

19 After previous interactions with  
20 management and OGC, the Staff agreed that endorsing  
21 the standard with a trial use reg guide would be the  
22 best option going forward.

23 And as I was trying to explain earlier on,  
24 this option allows the NRC to incorporate lessons  
25 learned during the trial use period and will also

1 allow us to account for regulatory activities like the  
2 Part 53.

3 We're also taking into account that the  
4 standard might be revised at some point in the next  
5 few years so we would also be able to address any  
6 changes in the standard in the final reg guide.

7 Even though there will not be a public  
8 comment period for the trial use reg guide, the reg  
9 guide is publicly available so we encourage you to  
10 provide comments to the NRC.

11 We will take into account both the lessons  
12 learned from the trial use and comments received  
13 during that period. This will be considered in the  
14 final version of the reg guide.

15 There will be a formal comment period  
16 after the trial use period has been completed and the  
17 formal draft guide is issued.

18 So, in terms of the peer review guidance,  
19 the Staff found that the guidance provided in NEI 2009  
20 was acceptable and, therefore, there were no  
21 exceptions taken for endorsement of NEI 2009.

22 So, that completes my presentation, if  
23 there are no further questions, I will turn it over to  
24 the next speaker, which is Anders Gilbertson.

25 MEMBER BLEY: Before you go, Michelle, on



1 your last slide, those times when you expect to have  
2 a revised final guide and put it out for public  
3 comment, do you have any rough dates on when you  
4 expect that to happen?

5 MS. GONZALEZ: We haven't finalized that  
6 date yet, we've been speaking about 18 months so maybe  
7 3 years where we are expecting to have the trial use  
8 period completed and then we would go over the process  
9 to develop as a draft guide.

10 MEMBER BLEY: Have you gotten any  
11 indications from potential Applicants or vendors about  
12 further expected trial use in the next year or so?

13 MS. GONZALEZ: Not exactly.

14 MEMBER BLEY: Thank you.

15 MS. GONZALEZ: You're welcome.

16 MR. PHAN: Anders?

17 MR. GILBERTSON: Yes?

18 MR. PHAN: Good morning, my name is Hanh  
19 Phan, one of the presenters in this briefing.

20 I'd like to mention that first I did not  
21 see the slides on the screen but after I hit the show  
22 conversation option and then I re-hit that one, the  
23 slide came up.

24 So, you may try that, it may help you to  
25 see the slides on the screen.

1                   MEMBER BLEY: Thank you, everybody can try  
2                   that and I just thought in the last couple iterations  
3                   of this software, once in a while if you do something  
4                   on your screen the slides might jump down on the lower  
5                   bottom and be down there and you have to click on them  
6                   to get them back on your main screen.

7                   So, take a look at that bar at the bottom  
8                   as well as what Hanh just suggested.

9                   MR. GILBERTSON: Good morning, Members of  
10                  the ACRS Subcommittee, my name is Anders Gilbertson,  
11                  I am a reliability and risk analyst in the Office of  
12                  Nuclear Regulatory Research.

13                  And before I get started, Dr. Bley, I just  
14                  wanted to also follow on Michelle's response to your  
15                  question about the timeframes.

16                  At the moment, we're anticipating that we  
17                  may be somewhat dependent on the schedules of the  
18                  standards development organization, so the JCNRM, in  
19                  terms of when they anticipate producing a subsequent  
20                  revision and that there have been enough lessons  
21                  learned.

22                  So, the whole notion of 12, 18, 24 months,  
23                  it's very rough but really, it's going to primarily  
24                  depend on whether or not we have enough lessons  
25                  learned.

1                   MEMBER BLEY: Sure, and maybe they'll want  
2 to say something when they come up later today. Go  
3 ahead.

4                   MR. GILBERTSON: Can you move to Slide 9,  
5 please? There are four main topics that I'm going to  
6 address this morning.

7                   First, I'm going to talk about the  
8 regulatory paradigm that Reg Guide 1.247 addresses.  
9 I'll then talk about how the Staff approached the  
10 development of the reg guide to reflect that paradigm.

11                  And because Reg Guide 1.200 was the  
12 starting point for Reg Guide for 1.247, even before I  
13 get into the more detailed comparison in that third  
14 bullet, I will naturally be drawing some higher-level  
15 comparisons between the two reg guides all the way  
16 just because it falls out naturally from the  
17 discussion.

18                  And then finally, I will talk about some  
19 of the new Staff positions in Reg Guide 1.247 had been  
20 previously addressed as it relates to peer  
21 acceptability.

22                  And I think as we go forward, I may end up  
23 addressing some of the questions that were previously  
24 asked by the ACRS Subcommittee Members.

25                  So, with that, please move to Slide 10.

1 So, regarding the regulatory paradigm that Reg Guide  
2 1.247 is meant to operate in, Reg Guide 1.247 is not  
3 specifically intended to meet any one regulatory  
4 requirement.

5 So, for many reg guides, their purpose is  
6 to provide an acceptable means of meeting a specific  
7 regulatory requirement.

8 Now, like Reg Guide 1.200, Reg Guide 1.247  
9 is used to determine the acceptability of a PRA that's  
10 used to support a regulatory decision but there are  
11 some differences, as I'll go into.

12 At the moment, the application of Reg  
13 Guide 1.247 includes applications for non-LWRs under  
14 Parts 50 or 52 and for Part 52, a PRA is currently  
15 required. Part 50 is expected to soon follow after  
16 the completion of the related rulemaking.

17 That's intended to align the two parts.  
18 Section A of Reg Guide 1.247 provides a listing of  
19 applicable regulations for which an Applicant may use  
20 the reg guide to support meeting.

21 Michelle touched on this a little bit but  
22 as we look forward, we anticipate that Reg Guide 1.247  
23 will be applicable to the anticipated 10 CFR Part 53  
24 once that rulemaking is complete.

25 However, up until that point, the Reg

1 Guide 1.247 only addresses current published  
2 regulations and does not provide any Staff positions  
3 on the anticipated 10 CFR Part 53 or other future  
4 activities.

5 MEMBER BLEY: Anders, this is an unfair  
6 question but it hit me out of the blue last week. The  
7 industry released an announcement, I think it was an  
8 ANS one, that the Staff position paper on how to deal  
9 with micro-reactors was out and they had a link to it.

10 My understanding is that's really pretty  
11 early in the process for you. It's not an approved  
12 position paper and eventually, I assume we'll hear  
13 about it.

14 But if you can say anything about how that  
15 ties in with this work and with the Part 53 work just  
16 to give us a heads-up, that would be interesting. If  
17 you can't, that's fine too.

18 MR. GILBERTSON: I can generally speak to  
19 it. Marty Stutzke is certainly far more familiar with  
20 it as he's been involved in some of these peripheral  
21 efforts.

22 But it's a good question because it kind  
23 of helps point out that Reg Guide 1.247 does have many  
24 connection points to other NRC activities.

25 So, as you're asking about, the initiative

1 for graded PRA is being considered which I think  
2 micro-reactors falls under that and do you need to do  
3 a full-blown PRA for a micro-reactor? That kind of  
4 thing.

5 So, yes, there are connection points.  
6 Like I said, Marty's been involved in a lot of those  
7 activities. Also, the guidance for developing the  
8 content of applications, the TICAP and the ARCAP  
9 efforts.

10 So, I'll leave it there and Marty, if you  
11 want to chime in please feel free to go ahead.  
12 Otherwise, I'm happy to see if that satisfies it for  
13 now.

14 MR. STUTZKE: Yes, this is Marty Stutzke  
15 with NRR. What I would add is in addition to the  
16 micro-reactor draft staff white paper, I'm personally  
17 involved in the Part 53 rulemaking team and the graded  
18 PRA initiative.

19 And the TICAP, ARCAP development guidance.  
20 So, we're reasonably well coordinated among all these  
21 things and we're trying to develop Reg Guide 1.2747 to  
22 address all of these activities.

23 MEMBER REMPE: This is Joy and to follow  
24 Dennis's question, one of the reasons this standard is  
25 all inclusive might be that you've got to consider all

1 the hazards associated at the site, including the  
2 spent fuel.

3 And so with the thing about micro-  
4 reactors, how will a PRA deal with that where this is  
5 the potential when you don't have a place to send them  
6 back to, you could accumulate a lot of spent micro-  
7 reactors.

8 Is that being considered? You don't have  
9 to analyze it but just say you need to consider this  
10 as a hazard source.

11 MR. STUTZKE: I'll answer that. In  
12 general, what Reg Guide 1.247 requires is that the PRA  
13 address all radiological sources at the site, all  
14 plant operating modes at power shutdown  
15 configurations, and all internal and external hazards.

16 So, we think we're comprehensive.

17 MEMBER REMPE: So, you've told them they  
18 need to do that, is what the answer to my question is?

19 MR. STUTZKE: Yes.

20 MEMBER REMPE: Even though you don't give  
21 them much guidance on how to do it, they should  
22 clearly know they're going to have deal with that?  
23 And that includes when you said how big the site  
24 boundary should be, right?

25 MR. STUTZKE: Yes.

1 MEMBER REMPE: Thank you.

2 MEMBER BLEY: Let me take you a little  
3 further, you probably don't want to talk about it but  
4 it relates to Charlie's question.

5 I could see how this could become the PRA  
6 standard and we wouldn't need all the pieces that were  
7 developed throughout the LWR development process for  
8 PRA.

9 This might tie everything together here  
10 and there could one day be a single standard for PRA  
11 for all nuclear power-plants. Is that the idea,  
12 working this way around or is that something you might  
13 see in the next two to five years?

14 MR. GILBERTSON: I can address that. Yes,  
15 that is a notion that has been talked about. If you  
16 look at the non-LWR PRA standard, in theory there  
17 isn't really any reason why you couldn't use that  
18 standard to perform a PRA for an LWR.

19 MEMBER BLEY: I certainly agree with you.

20 MR. GILBERTSON: And that was under the  
21 guise of being technology inclusive. This Reg Guide  
22 1.247 really is in many regards something of an  
23 evolution of the way NRC is addressing PRA  
24 acceptability.

25 We recognize that because of it's



1 completeness, we will have to consider it heavily when  
2 we are sitting down to develop the next technical  
3 revision of Reg Guide 1.200 for LWRs.

4 And I think it's certainly conceivable  
5 that perhaps in the end, we end up having one reg  
6 guide. That's just my opinion, I'm not speaking to  
7 whatever plans the Staff have but it's certainly  
8 possible.

9 MEMBER BLEY: Thank you, that makes sense  
10 to me and would explain how the language has evolved  
11 from 1200 and the same language then would apply to  
12 everyone.

13 Marty was talking about what he called the  
14 initiative for graded PRA and I really look forward to  
15 hearing more about that at some point in the future.

16 Is there conversation with the standards  
17 folks? Are they likely to issue a standard in that  
18 same area or will this strictly be an NRC initiative?  
19 We'll hear from them later, if they want to talk about  
20 that it's a heads-up to them.

21 MR. GILBERTSON: I can't speak for them  
22 and as far as the NRC is concerned, I would just point  
23 to our efforts for looking at graded PRA.

24 I think it's going to evolve as we  
25 continue to develop, continue to understand the needs

1 of industry and what we need to do to help ensure  
2 we're meeting the mission.

3 MEMBER BLEY: Thanks very much, go ahead.

4 MEMBER DIMITRIJEVIC: I have a slightly  
5 different question. Can you elaborate a little more  
6 on this second bullet on what says the use of this reg  
7 guide addresses the needs for in-depth review of the  
8 PRA?

9 What does that imply?

10 MR. GILBERTSON: Actually, I was just  
11 about to get to that. Let me just go ahead and jump  
12 right into it. Reg Guide 1.247, the way this was  
13 developed was that it helps to reduce the need for an  
14 in-depth review of the PRA.

15 And I emphasize the word reduce, as you're  
16 questioning about, because it's different from Reg  
17 Guide 1.200, which relates to obviating the need. So,  
18 the term reduce relates in part to the different scope  
19 of regulatory activities addressed between the two reg  
20 guides.

21 Reg Guide 1.247 is addressing the initial  
22 licensing activities such as submittal of design  
23 certifications, permits, license requests, and it also  
24 addresses risk-informed regulatory activities  
25 following the issuance of a license permit or

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1 certification.

2 So, it communicates the Staff have a  
3 little more latitude in requesting information about  
4 an Applicant's PRA.

5 And so in general, Reg Guide 1.247, and  
6 I'll talk about this a little bit more, it still has  
7 the same type of framework, paradigm as 1.200 where  
8 the approach is to develop your PRA as endorsed by an  
9 NRC consensus standard and then perform an NRC  
10 endorsed peer review process.

11 That helps to the Staff gain confidence  
12 that the PRA is acceptable for use in risk-informed  
13 decision-making, however, the reg guide is just  
14 guidance, Applicants don't have to use it, there are  
15 no requirements to used Reg Guide 1.247.

16 Does that help address your question?

17 MEMBER DIMITRIJEVIC: It makes me slightly  
18 less confused but let's say you have Applicants with  
19 design certifications and your use of these guides  
20 would not be required.

21 Let's say the Applicant has been reviewed  
22 before the applications. Would the peer review  
23 process of design certification be different from that  
24 Applicant who has a peer review already performed?

25 MR. GILBERTSON: Are you're saying they

1 are peer reviewing not against an NRC-endorsed  
2 consensus standard?

3 MEMBER DIMITRIJEVIC: No, they're  
4 reviewing this process, the NEI which is endorsing  
5 1.247.

6 MR. GILBERTSON: I guess what I would say  
7 to that is if an Applicant chooses to use a portion of  
8 this reg guide, then certainly the Staff may need to  
9 ask additional information to help gain that  
10 confidence.

11 So, for example, if an Applicant performs  
12 their PRA and develops it, they perform an internal  
13 self-assessment and then they feel they're ready to  
14 submit, they don't do an independent peer review but  
15 they say, look, we met the Staff positions in Reg  
16 Guide 1.247 as it relates to the consensus PRA  
17 standard.

18 So, because the peer review wasn't  
19 performed, there's still a need for the Staff to  
20 determine in some manner that the PRA is in fact  
21 acceptable, as dictated by the self-assessment and  
22 also by our own questions and reviews.

23 So, that would be a case where there could  
24 be a more in-depth review, which again, this is why  
25 using Reg Guide 1.247 helps reduce the need for that

1 in-depth review.

2 But because this is in the context of the  
3 initial licensing activities and you have requirements  
4 to develop a PRA, describe it in the final safety  
5 analysis report, it's a little bit different than  
6 receiving a license amendment request for a 5069  
7 program or risk-informed tech specs using Reg Guide  
8 1.200.

9 That process has been established as you  
10 perform the PRA for the PRA standard, you do the peer  
11 review and then if there are issues that raise above  
12 a certain threshold, namely a finding level and  
13 observation, those get reported to the NRC.

14 But the licensee is not submitting the  
15 entire PRA.

16 MEMBER DIMITRIJEVIC: That's exactly the  
17 difference which I was confused about.

18 I'm all for risk-informed applications,  
19 you don't have to submit that and the full PRA, if you  
20 have PRA peer review perform, that's different when it  
21 comes to supplying PRA for design certifications, for  
22 example.

23 I'm still confused about that but I think  
24 somewhere that will all be clear so thank you.

25 MR. GILBERTSON: I think another bullet or

1 two later on might help to clarify that.

2 MEMBER BIER: If I could interrupt  
3 briefly, this is Vicki Bier, just to clarify the  
4 response to Vesna's statement, when you said the level  
5 of Staff review could be reduced, that's presumably at  
6 the discretion of Staff?

7 If they see issues they consider to be red  
8 flags or need going into, they have the option to do  
9 that but not an obligation to do that, is that  
10 correct?

11 MR. GILBERTSON: Generally, yes, and of  
12 course, if the Staff are intending to ask for more  
13 detailed information specifically about the PRA, there  
14 is still a need to develop a regulatory basis for  
15 asking that information.

16 So, in that regard, this notion that the  
17 Staff have more latitude is really something of a  
18 statement that developing that regulatory basis is a  
19 little more straightforward or it's not that difficult  
20 to put together, generally speaking.

21 MEMBER BIER: Thank you.

22 MR. GILBERTSON: You're welcome. I will  
23 go ahead and move on if there are no questions. So,  
24 the last point here that I wanted to talk about, Reg  
25 Guide 1.200 uses the term application and it's mostly

1 referring to voluntary regulatory activities occurring  
2 after the issuance of a license.

3 So, like I mentioned, a license amendment  
4 request for 50.69 or some other risk-informed program.  
5 It is also meant to address regulatory applications  
6 related to standard design certifications and combined  
7 licenses.

8 It's just Reg Guide 1.200 hasn't been used  
9 to that effect since it was published. But because  
10 the range of potential regulatory activities for non-  
11 LWRs that Reg Guide 1.247 may be used for is broader.

12 The term application in Reg Guide 1.247  
13 mostly refers to both the initial licensing regulatory  
14 activities and the risk-informed regulatory activities  
15 following the issuance of a license certification or  
16 permit.

17 And yes, that is that point. Can you move  
18 to Slide 11, please? So, there is no regulatory  
19 requirement for the performance of a peer review for  
20 a PRA used in risk-informed decision-making.

21 However, experience with the use of Reg  
22 Guide 1.200 has demonstrated that there are clear,  
23 tangible benefits from the performance of an  
24 independent peer review.

25 So, while it remains true there are no

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1 requirements, the Staff are encouraging that a user of  
2 Reg Guide 1.247 perform a peer review because it so  
3 helps with gaining that confidence that the Staff need  
4 to make their decision.

5 It just helps to improve the efficiency of  
6 Staff reviews as well. So, as I mentioned before, PRA  
7 is required for new Part 52, applications, which  
8 again, Part 50 is soon to follow after the related  
9 alignment rulemaking is complete.

10 And application required by regulation to  
11 develop, maintain, and upgrade -- I'm sorry, an  
12 Applicant is required to develop, maintain, and  
13 upgrade a PRA as per 10 CFR 50.71 Hotel, which  
14 incidentally references Part 52.

15 There are also regulatory requirements  
16 related to the use of plant-specific PRA information,  
17 for example, 10 CFR 52.79.

18 Now, because a PRA is used to help develop  
19 and support the licensing basis for a given  
20 application, I mentioned this before, this is the  
21 notion that Staff have more latitude to request  
22 information than they would, for example, for a  
23 risk-informed license amendment request using Reg  
24 Guide 1.200.

25 So, like I said, for Reg Guide 1.200, the

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1 guidance in that document relates to performing an  
2 independent peer review to ensure the PRA meets the  
3 NRC-endorsed consensus standard, and if issues rise  
4 above a certain threshold, those issues and the  
5 results of the peer review are submitted to the Staff  
6 for review.

7 And so in that regard, sometimes it's not  
8 as straightforward for the Staff to develop a  
9 regulatory basis that might allow them to say look at  
10 a specific part of a licensee's PRA.

11 And again, that's going to be different  
12 for new Applicants, non-LWR Applicants, using Reg  
13 Guide 1.247.

14 MEMBER HALNON: Anders, this is Greg. Why  
15 is soft approach to the peer review? Why not make it  
16 a little bit more stringent in saying peer reviews are  
17 not only recommended but a key part of the process  
18 itself and make it more stringent?

19 MR. GILBERTSON: I think it's in some part  
20 because of the framework that we're operating in. Reg  
21 Guide 1.200, there is no requirement for an operating  
22 licensee with a Part 50 license to use a PRA.

23 So, all of those activities are voluntary  
24 activities. For 1.247, we're in this situation where,  
25 again, a PRA is required as part of the final safety

1 analysis report and to establish the licensing basis  
2 for the plant.

3 So, in that regard, it is clearly  
4 important but I think we have a different -- I'm  
5 trying to think of the history of the development of  
6 Reg Guide 1.200 and like Dr. Bley mentioned before,  
7 it's been done in some regards in piecemeal fashion.

8 The most important risk readers were  
9 developed first and those were put forward in the  
10 standard and such.

11 And the Staff, as they considered how the  
12 PRAs might be used, they recognized there was a need  
13 to ensure the PRA is actually doing what it's supposed  
14 to do, it works the way it's supposed to work and has  
15 all the right information, et cetera.

16 So, that's what motivated that peer  
17 review.

18 In the end, I guess I would probably go  
19 back to the idea that there is no requirement for  
20 performing a peer review.

21 However, if a peer review is not provided  
22 and, for example, an Applicant just submits their PRA  
23 and says we think this is good enough, the Staff are  
24 going to have to look at that and we have to make that  
25 assessment.

1                   Is it acceptable? Does it meet the Staff  
2 positions? Did it really meet the requirements they  
3 indicated it met in the consensus standard?

4                   MEMBER HALNON: I guess the question now  
5 when you say that, is there a crossroads in the  
6 guidance, the Staff guidance, on reviewing  
7 applications and whatnot that say go this path if the  
8 peer review was done?

9                   If not, go this other path that asks those  
10 questions?

11                  Because it seemed like those questions  
12 would be asked in either case.

13                  MR. GILBERTSON: I think to the extent the  
14 reg guide does address that, I think it's probably at  
15 a very high level and just to convey that if you're  
16 not using part of Reg Guide 1.247, then effectively,  
17 you're in this situation where the NRC are performing  
18 an ad hoc review.

19                  And we have to judge it on a case-by-case  
20 basis.

21                  MEMBER HALNON: Thanks, I'll keep that in  
22 mind as we go through the rest of it.

23                  MR. GILBERTSON: Slide 12, please? I  
24 mentioned this before, Reg Guide 1.200 Revision 3  
25 effectively was the template for the development of

1 Reg Guide 1.247.

2 Some reorganization of the information has  
3 occurred, as you're probably aware, however, the key  
4 elements of Reg Guide 1.247 mimic that of Reg Guide  
5 1.200.

6 So, essentially, we wanted to maintain the  
7 overall framework that these reg guides operate in.  
8 So, for example, just a brief example, the Staff  
9 position in Section C.1 is organized by scope, level  
10 of detail, conformance to PRA standards, and plant  
11 representation in Reg Guide 1.247.

12 Reg Guide 1.200 for whatever reason, it  
13 swapped level of detail and conformance of PRA  
14 standards. But the substance of those pieces are  
15 ostensibly mimicked in Reg Guide 1.247.

16 So, as a regulatory body, the NRC needs to  
17 ensure consistency of related Staff positions,  
18 particularly in technical areas where a position is  
19 technology-neutral.

20 So, the Staff in that regard need to be  
21 sensitive to the fact that Staff positions in Reg  
22 Guide 1.247 might set a precedent for revising related  
23 Staff positions on PRA acceptability for LWRs.

24 And particularly, where those Staff  
25 positions are technology-neutral. And so like I

1 mentioned before, this is one of the areas where we  
2 are going to be looking very closely at Reg Guide  
3 1.247 when we start and start laying out and planning  
4 and developing the structure of the next technical  
5 revision to Reg Guide 1.200.

6 We don't anticipate that it will be  
7 significantly different and significantly reorganized  
8 but certainly as we've been developing Reg Guide 1.247  
9 we've been keeping in mind this idea that we're going  
10 to be then doing Reg Guide 1.200.

11 And so we have tried to institute changes  
12 in the way we write thing in a way that we would want  
13 to do it in Reg Guide 1.200.

14 And I think we've already talk about the  
15 fact that NEMA has provided significant impetus to  
16 both industry and the NRC to complete a non-LWR PRA  
17 standard and endorse it respectively.

18 So, as far as the history is concerned,  
19 the Light Water Reactor PRA standards were developed  
20 first and for several years, more than a decade or so,  
21 the standards development organizations really focused  
22 on light water reactors because those were the  
23 applications that were relevant at the time.

24 I think it was around about 2009, someone  
25 from the JCNR can correct me, when the efforts were

1 initiated to develop the non-LWR PRA standard, which  
2 again led up to the 2013 trial use non-LWR PRA  
3 standard, and subsequently where we are today.

4 So, because the ASME ANS non-LWR PRA  
5 standard has been developed to derive and largely  
6 mimic what has already been tested and tried out in  
7 the LWR PRA standards.

8 So, in that regard, the non-LWR PRA  
9 standard and the LWR PRA standards that are under  
10 development currently are very closely related.

11 And because the NRC has previously  
12 promulgated Staff positions on LWR PRA acceptability  
13 in Reg Guide 1.200, these two things together create  
14 a crucial need to ensure the Staff are coordinating  
15 the positions across the different technologies as it  
16 relates to PRA acceptability.

17 Dr. Bley, this goes to that notion that  
18 in the future it's possible that there could just be  
19 one PRA standard and that just covers everything and  
20 there could be one reg guide that endorses the entire  
21 scope.

22 So, in developing positions, the Staff  
23 needed to consider what the anticipated Staff  
24 positions might be for future endorsements of the new  
25 LWR PRA standards that are currently under

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1 development.

2 And we've already talked about the notion  
3 that the non-LWR standard could in theory be used for  
4 LWRs, even though its primary focus is for non-LWRs.

5 Slide 13, please? With the understanding  
6 of the non-LWRs and the related to LWR PRA standards  
7 are very intimately connected with several hundreds of  
8 relationships between related requirements.

9 The Staff identified the need pretty early  
10 on to systematically identify and objectively compare  
11 related requirements between different documents in  
12 anticipation of future endorsements of the LWR PRA  
13 consensus standards.

14 So, this mapping and comparison effort  
15 really helped to orient the Staff, the review of the  
16 Staff, with respect to where related requirements were  
17 effectively technology-neutral.

18 And it helped us prioritize the  
19 development of those Staff positions.

20 So, for example, the ones that needed the  
21 most attention and the ones in particular, that  
22 relates to requirements that are related between  
23 non-LWR and LWR but they're different in the non-LWRs  
24 for some specific reason.

25 It may have to do with the technology or

1 it may have to do with the question the non-LWR PRA  
2 standard was developed and that it considers all scope  
3 iteDr.

4 In addition to allowing comparisons  
5 between multiple-related PRA standards, the Staff had  
6 developed a database to do this activities, to do this  
7 mapping and comparison.

8 And we had a contractor go and  
9 systematically identify related requirements, do the  
10 comparisons, and then provided those to the Staff.

11 In addition to allowing comparisons  
12 between multiple-related PRA standards, the database  
13 tools allowed also for comparison against the Staff  
14 position in Reg Guide 1.200.

15 So, that is to say that the Staff were  
16 interested in looking at the requirements in the non-  
17 LWR PRA standard, connecting them back through the  
18 relevant documents related to LWR and then connecting  
19 that back to the Staff position in Reg Guide 1.200 on  
20 LWR PRA acceptability.

21 And what that essentially means is the  
22 Staff endorsement of the 2009 Level 1 LERF LWR PRA  
23 standard. So, it's somewhat convoluted but it's a  
24 complex kind of exercise to tie it back.

25 But really, it was intended to just ensure



1 that, okay, as we write our Staff position now for  
2 non-LWR PRA standards, we aren't being inconsistent  
3 with something we wrote in Reg Guide 1.200, where it  
4 would be appropriate to be consistent, so technology-  
5 neutral requirements.

6 MEMBER DIMITRIJEVIC: I just want to point  
7 out when you compare that requirement to requirement  
8 I'm sure they will not find there are too many  
9 differences. But there is a difference in the  
10 high-level requirement and the scope.

11 This standard requires Level 3 PRA which  
12 didn't require, there is this risk integration which  
13 we also discussed in the one, there are source terms.

14 So, there is a difference in the scope and  
15 level of requirement and the question is why is that?  
16 Why is there a difference in the scope which is not  
17 given by the technology differences?

18 MR. GILBERTSON: Yes, so I think the most  
19 direct answer to that question is that Reg Guide 1.247  
20 was developed with a very strong attention to our  
21 understanding that we expect to receive applications  
22 using the Licensing Modernization Project, or LMP, if  
23 you will.

24 And so if an Applicant uses LMP, what that  
25 effectively means is that they necessarily need to

1 develop a PRA that goes all the way out from an  
2 initiator all the way out to consequence and  
3 frequency.

4 Because that's the metric against which  
5 the risk is measured in the LMP guidance and NRC have  
6 endorsed that. So, because we understand those types  
7 of applications will be coming in, we had to be sure  
8 that we are being comprehensive in our Staff  
9 positions.

10 And so like you said, we've got Level 3  
11 now, the consequence analysis, we're addressing all  
12 plant operating states for all hazards, that kind of  
13 thing. We want it to be complete so that we can  
14 accommodate those applications.

15 I'll talk a little bit more about those  
16 new Staff positions and what some of the limitations  
17 are on those. Can we move on to Slide 14, please?

18 I will run through this a little quickly,  
19 I think I'm starting to maybe go over my time here.  
20 The next few slides are really just to talk about and  
21 give you some general differences between Reg Guide  
22 1.247 and 1.200.

23 And I mentioned some of these points  
24 before so Reg Guide 1.200, it directly relates to  
25 meeting regulations. So, an Applicant may use it to

1 establish PRA acceptability for the PRA they submit  
2 with their standard design certification with their  
3 combined license, whatever the case may be.

4 Reg Guide 1.247 does provide Staff  
5 positions that are different from 1.200 as you've  
6 noticed.

7 I will talk about those a little bit later  
8 on and Reg Guide 1.247, as far as relatively risk  
9 significance criteria are concerned, the reg guide  
10 communicates that they should be used to develop the  
11 PRA.

12 However, the use of absolutely or relative  
13 risk significance criteria in an application will  
14 generally be application-specific so it may be that  
15 some applications only use absolutely risk  
16 significance to determine what are the most important  
17 aspects of the risk for an application.

18 Slide 15, please. Some additional  
19 differences, the non-LWR standard presents PRA  
20 requirements with respect to a more comprehensive  
21 scope.

22 We've talked about that, it covers all  
23 sorts of radioactivity, all hazards, all plant  
24 operating states, and all levels of analysis.

25 And while the non-LWR PRA standard does

1 accommodate the development of intermediate risk  
2 metrics, for example, something like an analog for  
3 LWRs like CDF and LERF, the non-LWR standard does not  
4 specifically refer to these constructs of a Level 1  
5 analysis, a Level 2, or a Level 3.

6 But instead, it frames it as having the  
7 analysis start from the initiator going all the way  
8 out to radiological consequence. So, it's intended to  
9 be essentially a sort of fully integrated analysis.

10 And likewise, the Staff avoided the use of  
11 the terms that define those typical transition points  
12 in a PRA for LWRs, which doesn't mean they can't be  
13 readily related to just because we're so familiar with  
14 it for LWR activities.

15 But it's also important to note that while  
16 Reg Guide 1.247 does talk about intermediate risk  
17 metrics like CDF and LERF, justifying the use of an  
18 intermediate risk metric in the context of satisfying  
19 a full PRA analysis would generally expect to be  
20 fairly challenging.

21 So, that's to say that if, for example,  
22 someone for a non-LWR PRA submitted with some  
23 intermediate risk metric that stops just before the  
24 core is damaged, if you will, or there's damage to the  
25 fuel, stops the analysis there but then develops a

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1 justification to show that the consequence metrics are  
2 satisfied or that the quantitative path objectives in  
3 the NRC Commission policy statements are satisfied,  
4 are met.

5 That is generally expected to be a fairly  
6 challenging exercise, but again, we don't dictate in  
7 Reg Guide 1.247 what approach an Applicant should  
8 follow.

9 In that regard, 1.247, like 1.200, is  
10 something to help give confidence to an Applicant that  
11 if this approach is used, which the Staff have already  
12 approved and find acceptable, the review ought to go  
13 smoother.

14 MEMBER BLEY: It sounds like you're  
15 halfway through graded PRA fitting within this  
16 framework, is that fair to say? You have to justify  
17 what you're doing but you could.

18 MR. GILBERTSON: That's right, I guess it  
19 relates to graded PRA but as I understand it and Marty  
20 can certainly speak to this in more depth, graded PRA  
21 is going to be more of if you've got a very small  
22 source term and your reactor is not that complex.

23 Why do I have to do the full-blown  
24 analysis? I can just show that even if I get to here  
25 for any number or variety of sequences, the source

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1 term is still just so small. But Marty, is that  
2 something you want to speak to briefly?

3 MR. STUTZKE: Yes, one of the challenges  
4 for the graded PRA is trying to define what we're  
5 actually grading and the current focus of that effort  
6 is looking at methods that could be done in lieu of  
7 performing a PRA.

8 It's clear, as I've said before, whatever  
9 methods you decide to use, you still need to look at  
10 all the radiological sources and all the plan operated  
11 states, and all the internal and external hazards like  
12 that.

13 Now, in doing that whether you need to go  
14 all the way out to the consequence evaluation hasn't  
15 yet been determined.

16 But I would agree with Anders that the  
17 focus on of the graded PRA would be to support  
18 approaches such as a maximum hypothetical accident  
19 approach to licensing.

20 It's similar to the question we do  
21 research and test reactors.

22 MEMBER BLEY: Okay, thanks, Marty.

23 MR. GILBERTSON: I'll go ahead and move on  
24 here. I don't want to shorten my colleagues for their  
25 speaking time so I'll try and expedite this a little

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1 bit.

2 So, just some of the additional  
3 differences, like I mentioned before, 1.247 was  
4 intended to really be able to accommodate a PRA that  
5 would be used for an LMP application.

6 We understand those applications are very  
7 likely to come in so we wanted to hit that head on and  
8 make sure the guidance was available.

9 As far as NEI 2009 here, the Staff worked  
10 together with industry, we commented on drafts that  
11 they provided and this was all in the interest of  
12 trying to reduce any of the exceptions.

13 In the end, we identified no exceptions  
14 that needed to be taken. So, as a result, there's  
15 nothing really to write an exception for in a table of  
16 an Appendix.

17 So, instead, we just focused on  
18 emphasizing parts of the guidance in NEI 2009 that the  
19 Staff would like to people to pay attention to.

20 And the last four points here, I'll get  
21 into those in the last slides and these are the scope  
22 elements that are not addressed in Reg Guide 1.200.

23 So, Slide 16, please? These are the PRA  
24 elements that are common to both Reg Guide 1.247 and  
25 Reg Guide 1.200. So, there are about 15 of these

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1 elements. Now, keeping in mind that Reg Guide 1.200  
2 ostensibly addresses for most of the hazards at power  
3 plain operating state.

4 There is some consideration of low-power  
5 and shutdown operating states but it's in the context  
6 of an internal events hazard and so not for other  
7 hazards. So, it's a little bit of a different kind of  
8 separation of the different pieces of scope.

9 Slide 17, please? So, some of the  
10 similarities, both Reg Guide 1.247 and 1.200, they  
11 have a table of hazards in the Appendix at the end of  
12 the document that are intended to be considered in  
13 development of a PRA.

14 Now, understanding this can serve as a  
15 starting point, it's not intended to be an exhaustive  
16 list that are the absolute minimum that have to be  
17 considered.

18 In that regard, especially when meeting  
19 the requirements in the standard, there still will be  
20 a need to go through and ensure you have a process  
21 that is systematically identifying what hazards could  
22 potentially affect your plant, screening out hazards  
23 that are judged not to affect it, et cetera.

24 So, those lists are not meant to be  
25 comprehensive and represent a minimal list.



1 Another similarly, this just goes to the  
2 fact that the structure is generally the same between  
3 the two reg guides in terms of telling what an  
4 acceptable PRA is, speaking to the use of voluntary  
5 consensus standards and a peer review process,  
6 demonstrating acceptability of a peer review for an  
7 application, and then of course the documentation that  
8 you need to support a regulatory decision.

9 Slide 18, please. These are the four  
10 Staff positions that I'll go over in detail for each  
11 of these in the next slide. Slide 19, please?

12 Reg Guide 1.200 primarily addresses LWR  
13 risk from the at-power operating mode like I mentioned  
14 before, with some consideration of low-power and  
15 shutdown operating modes.

16 Reg Guide 1.247 relates more to plant-  
17 operating states versus talking about at-power and  
18 low-power shutdown operating modes.

19 So, one of the things that you'll see in  
20 Reg Guide 1.247 is that we talk about at-power types  
21 of plant operating states, or low-power shutdown types  
22 of plant operating states.

23 One of the reasons we did this was really  
24 to accommodate the notion there may be more than one  
25 type of at-power state that a PRA is developed for.

1           For example, if a plant or a design allows  
2           for online refueling, that could be a significantly  
3           different configuration of the plant than it is for  
4           just normal at-power steady-state operations,  
5           different systems might be disabled, et cetera,  
6           whatever the case may be.

7           So, we wanted to be able to make sure we  
8           were consistent with the non-LWR PRA standard and that  
9           we were able to accommodate those potential for  
10          different types of states.

11          And then again, the Staff positions in Reg  
12          Guide 1.247, in many instances, they'll set a  
13          precedent for future Staff positions and endorsements  
14          of consensus standards for the LWRs.

15          So, for example, when the low-power and  
16          shutdown LWR PRA standard is published, the NRC will  
17          need to determine whether it's going to be endorsed.  
18          And now that we'll have Reg Guide 1.247, again, we've  
19          got this precedent for developing a Staff position.

20          And so again, certainly the Staff  
21          positions in Reg Guide 1.247 are going to necessarily  
22          inform that endorsement. Slide 20, please?

23          We have not yet developed a position on  
24          internal fire PRA for low-power shutdown types of  
25          plant operating states for LWRs, however, we do expect

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1       that a submittal PRA could include this scope item  
2       because of an application and requirements to include  
3       full scope of everything.

4               This is a scope item for which there are  
5       no requirements in a non-LWR PRA standard and as such,  
6       the acceptability of the performance of that type of  
7       PRA would be measured directly against the Staff  
8       position in 1.247.

9               The Staff position was developed with an  
10       understanding that a similar position may also be  
11       developed for the future for LWR so again, looking  
12       forward to the next technical revision of 1.200.

13              And finally, I just wanted to note the NRC  
14       is performing research, we're in the midst of kicking  
15       off a research effort to develop guidance on  
16       acceptable means of developing an internal fire PRA  
17       for low-power and shutdown types of plant operating  
18       states.

19              That's intended primarily to support  
20       non-LWRs and applications using the standard in Reg  
21       Guide 1.247. But there will be natural connection  
22       points between that consideration for non-LWRs and for  
23       LWRs.

24              Slide 21, please.

25              Again, the Staff position on consequence

1 analysis is driven primarily by the anticipated LMP  
2 applications, however, outside of LMP applications,  
3 there are no regulatory requirements to develop a  
4 consequence PRA or analyzing the risk out to  
5 consequences.

6 Even still, the Staff believe it will be  
7 important for Commission expectations related to a  
8 consequence analysis to be met as provided in various  
9 policy statements, the safety goal policy statement,  
10 advanced reactor policy statement, et cetera.

11 Risk surrogates may be used, however, as  
12 I mentioned before, the use of those risk surrogates,  
13 the justification may be difficult to achieve, it  
14 could be quite a complex exercise.

15 Slide 22, please. So, talking about risk  
16 integration, again, the Staff have no previous  
17 position though we do have some relatively generalized  
18 guidance on risk segregation and risk integration in  
19 NUREG 1855.

20 It's quite high-level but it represents at  
21 least perhaps something of a starting point. The  
22 Staff position on risk integration is again, anchored  
23 in the Commission's expectations as it relates to  
24 policy statements and meeting the qualitative health  
25 objectives.

1           A specific application may not use  
2 relatively importance measures for this accordingly.  
3 Like I said, it may only use absolutely risk measures  
4 but the Staff still maintain the PRA should be  
5 developed using relative importance measures to  
6 determine what's important.

7           And then risk reporting thresholds, the  
8 Staff are not considering those in the Staff position  
9 because those are considered to be relevant on an  
10 application-specific basis.

11           So, that's to say that just because a risk  
12 contributor falls below a certain reporting threshold,  
13 it may not necessarily be unimportant to the  
14 decision-making process.

15           So, that's one of the reasons why we're  
16 not considering these risk reporting thresholds.  
17 That's the end of my slides.

18           MEMBER REMPE: This is Joy, I should have  
19 jumped in a bit earlier and I apologize, but in the  
20 section of C.1.3-17, the reg guide talks about  
21 economic factors and how the economic consequences  
22 should be quantified.

23           Are there any differences here to what  
24 exists in the current other guidance for LWRs?

25           MR. GILBERTSON: You know what? To answer

1 that question, I would defer to Keith Compton, he is  
2 our resident expert on consequence analysis and he's  
3 been involved in both efforts related to LWRs and  
4 non-LWR PRA.

5 Keith, is that something you can speak to,  
6 to answer Dr. Rempe's question?

7 DR. COMPTON: This is Keith Compton from  
8 the Office of Research. I just jumped in, it looks  
9 like I came in at the right time.

10 The answer to that is the elements in the  
11 reg guide and the non-LWR PRA standard largely follow  
12 the supporting requirements that were developed in the  
13 light water reactor PRA standard for Level 3.

14 I don't think there's anything that is  
15 particularly inconsistent with between what we'd be  
16 doing for, say, cost-benefit analysis, that's where  
17 you would consider economic factors in regulatory  
18 space.

19 MEMBER REMPE: I thought, correct me,  
20 maybe I'm wrong, the reg guide said that you are  
21 allowed to consider mitigating actions and things like  
22 that. I just am wondering if that is consistent with  
23 the current guidance for the LWRs.

24 DR. COMPTON: Do you consider the effects  
25 of protected actions on both dose and cost, is that

1 what you're referring to?

2 MEMBER REMPE: And for economic  
3 calculations, if there's land contamination or  
4 whatever. I just am curious, again, did it go  
5 further?

6 You're still saying, no, it's consistent  
7 with what's there in the existing regulation, the  
8 existing guidance for LWRs. I shouldn't call it  
9 regulation.

10 DR. COMPTON: I will look into more of it.

11 I guess I would just point out that if  
12 you're doing say a maximum calculation where you're  
13 looking particularly at long-term effects, you're  
14 doing a simultaneous calculation, both of the effects  
15 of the protected actions that reduce the consequences,  
16 that reduce the dose, and then your economic costs  
17 would arise from those protected actions.

18 MEMBER REMPE: Look into it and if you see  
19 something different please let us know. I just was  
20 curious because it seemed to me it was a little more  
21 realistic than what we were allowed to do for the  
22 LWRs.

23 That was just a read-through and I could  
24 be wrong.

25 DR. COMPTON: I will take that question

1 back to the folks that are working on the new cost  
2 benefit guidelines, which I think is what you're  
3 probably referring to.

4 MEMBER REMPE: Absolutely, thank you.

5 MEMBER BLEY: Anders, two things. One,  
6 we've gotten pretty far over the time and I want to  
7 get to the other talks but I wanted to let you get  
8 through all this.

9 How many more slides do you have?

10 MR. GILBERTSON: I'm finished, I was just  
11 able to hand it off to Hanh.

12 MEMBER BLEY: Before you hand off, Dr.  
13 Bier has a question. Vicki?

14 MEMBER BIER: I hope this is going to be  
15 quick. I'm just trying to figure out how all the  
16 pieces fit together especially with regards to peer  
17 review.

18 So, for example, you stated in this last  
19 part that the relative risk criteria should be used to  
20 develop the PRA even if the PRA results are not  
21 expressed that way.

22 But as I understand it, the licensee  
23 wouldn't even need to submit the PRA to the NRC if  
24 they go through peer review, et cetera. So, is the  
25 peer review process specified to level that it would

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1 have to check those kinds of things?

2 Like what are the relative risk criteria  
3 used in developing the PRA?

4 MR. GILBERTSON: If the user of the reg  
5 guide is intent on meeting the Staff position, then  
6 yes, it would need to address that.

7 MEMBER BIER: So, the peer review would be  
8 an NRC-oriented peer review, are you doing the things  
9 that NRC expects?

10 MR. GILBERTSON: Right.

11 MEMBER BIER: Got it, thank you.

12 MEMBER BLEY: Thanks, Anders. Before we  
13 go ahead with Hanh and Marty, I know I requested that  
14 part of the presentation today but I thought we needed  
15 to go through all yours, we're going to take a short  
16 break.

17 And Carl, look through your slides quickly  
18 and see if you can cut things down just a little bit  
19 to make up for the time that's passed.

20 At this time, we're going to take an  
21 almost 15-minute break and we'll come back at 11:20  
22 a.m. East Coast time. We are recessed for 13 minutes.  
23 See you all back in a minute.

24 (Whereupon, the above-entitled matter  
25 went off the record at 11:07 a.m. and

1 resumed at 11:19 a.m.)

2 This is Dennis Bley again, we're going to  
3 come back into session but one announcement before we  
4 do. For personal reasons, I'm going to have to drop  
5 off the call some time around an hour from now.

6 Dr. Dave Petti will take over chairing the  
7 meeting and wrap it up if we're not done by then.  
8 Given that we've slipped the schedule a bit, we  
9 probably won't be done by then.

10 Hanh, you go ahead with your talk, if  
11 there are things in your slides that we've already  
12 talked about, maybe you can skip over them to try to  
13 get through these a little faster and we look forward  
14 to your presentation.

15 Hanh, are you ready?

16 MR. PHAN: Yes, sir.

17 MEMBER BLEY: Please, good.

18 MR. PHAN: Good morning, again, my name is  
19 Hanh Phan, a senior PRA analyst in NRR, Division of  
20 Branch Reactors. Closely watching the clock, there  
21 are four more presenters after mine. I have 29 slides  
22 in my presentation.

23 With that, I will adjust my talk. For  
24 some slides I will not go over all bullets, please,  
25 stop me if you have any questions. Next slide, Slide

1 24, please.

2 In this portion of the program, I will go  
3 over the key guidance of Section C of Reg Guide 1.247  
4 and the start position for non-LWR PRA standard,  
5 documented in Appendix A of Reg Guide 1.247.

6 Next please. First, I'd like to recognize  
7 the effort of the technical staff for leading the  
8 reviews of these technical elements in the non-PRA  
9 standard and the peer review process in NEI 2009.

10 Next, please. Before getting into the  
11 details, I would like to briefly discuss the battery  
12 and the Applicant's ability of Reg Guide 1.247. 1.247  
13 addresses all radiological sources at the plant.

14 So, as reactor core is spent fuel, fuels  
15 repossessing facilities and accidents scenarios that  
16 lead to the radioactive list of multiple sources.  
17 It's also addresses more internal hazard and all  
18 external hazards.

19 It addresses all plant operating stage  
20 including at power, low-power, and shutdown. In  
21 general, we expect that.

22 The non-LWR PRA should be a Level 3 PRA,  
23 which develops the frequencies of excellent scenarios  
24 from an initiating event until the release of  
25 radioactive materials to the environment and should

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1 include the estimation of the consequences that result  
2 from the release.

3 Next please. Slide 27. This reg guide  
4 applies to applications for non-standard LWR licensing  
5 under 10 CFR Part 50. Of those, the current  
6 regulations do not require Applicants for PAC50  
7 construction permits or operating licenses to provide  
8 PRA-related information.

9 However, the Staff is currently working on  
10 the proposed new language in PAC50, which will require  
11 PRA information in the application similar to the  
12 requirements in PAC52.

13 This reg guide also applies to the  
14 application for non-standard UR licensing under Part  
15 52, including DC, COL, SDA, and ML. This reg guide is  
16 also coordinated with Part 53 to make an effort  
17 currently under development.

18 Page 8, please, Slide 28. Furthermore,  
19 1.247 only applies to the stationary non-standard URs  
20 for those reactors that are at the site. The reactors  
21 are constructed at an offsite facility and  
22 subsequently transported and installed at a site.

23 This addresses PRA used to assess the risk  
24 of comporting the reactors from an offsite facility to  
25 the site and does not address mobile reactors, which

1 may be relocated to multiple sites after the initial  
2 recalibrating.

3 Slide 29, please. 1.247 endures all 18  
4 elements in the non-UR PRA standard in addition to  
5 that. It also endures the definition PRA  
6 configuration control, peer review, and newly  
7 developed methods of the standard.

8 MEMBER BLEY: Can you go back one slide to  
9 28? I want to ask you a question about that. The  
10 last two bullets does not address the risk of  
11 transporting from an offsite facility to a site.

12 It also does not address from the site to  
13 some other facility for taking it apart and  
14 reassembling it.

15 When are those last two bullets going to  
16 be covered? Is that going to be under separate  
17 guidance or will that be in a revision to this  
18 guidance?

19 MR. PHAN: Based on my understanding,  
20 those are to be addressed by NMSS, not by the NRR.  
21 And we have no plans to update the standard on this  
22 reg guide.

23 MEMBER BLEY: Just for the Staff's  
24 information, and Derek, if you can track this, we  
25 ought to talk to NMSS and figure out what's happening

1 in that area. Sorry to interrupt you, Hanh, jump  
2 ahead to where you ought to be.

3 MR. PHAN: No problem. Thanks, sir. So,  
4 we're back to Slide 30. Regarding the non-mandatory  
5 appendix in the standard, they can be divided into two  
6 groups. Not to support the understanding of various  
7 supporting requirements and commentaries.

8 The NRC Staff generally accept the Staff  
9 of why no opinions about the commentaries. Next  
10 slide. In general, about 20 percent of the supporting  
11 requirements separate between Capability 1 and  
12 Capability 2 for comparison purposes.

13 For each technical element, the blue bars  
14 in this chart indicate the SR with the same  
15 requirements for both Capability 1 and 2 while the  
16 orange bars show the SR with different requirements.

17 Next please. Slide 32. The next slide in  
18 my presentation discuss the trial use records.

19 So, first, in Section C1, acceptability of  
20 a PRA and its resource, the Staff accept the  
21 acceptability of a PRA and its resources with respect  
22 to PRA scope, level of details, conformance with  
23 consensus standard, elements and plans representation  
24 of a PRA, similar to Reg Guide 1.200.

25 MEMBER DIMITRIJEVIC: I have a question on

1 these. This is one of my concerns with this. Is  
2 acceptability of the PRA the same as the acceptability  
3 of the PRA result?

4 Because sometimes we set the standard  
5 defines what is required and it doesn't specify how to  
6 do it.

7 That defines what is required and it  
8 doesn't specify what to do it. So, basically,  
9 standard defines everything which needs to be done to  
10 have a good PRA but it doesn't tell us anything is  
11 done technically correct or not.

12 Because it doesn't specify how to do it.  
13 So, I have an issue there, it's acceptability of the  
14 PRA the same as the acceptability of the PRA results?  
15 Do you understand what my concern is? Because the  
16 standard doesn't specify how to do it.

17 Different Applicants can choose different  
18 methods to address different requirements. Nobody  
19 guarantees that these methods would be technically  
20 correct, right?

21 MR. PHAN: Yes, I see your point and  
22 that's a great point. Yes, we combined both in the  
23 acceptability in this reg guide but I see the  
24 differences there. I totally see that, the standard  
25 only showing what to do, not how to do.

1           So, we later did the peer review that may  
2           rely on the outcome from that peer review and evaluate  
3           the result of the PRA for specific application.

4           But I see your point and that's clear to  
5           me, we may consider how to make the language clear in  
6           the reg guide. Thank you.

7           Slide 33, I will not go over the details  
8           in this slide, we don't have time. But for each  
9           criteria there are more details on this slide for PRA  
10          acceptability. Next please.

11          Now, in Section C3, the most frustrating  
12          acceptability of PRA and its resources, okay, so for  
13          all applications, the PRA-related information provides  
14          and the submitter should describe the PRA scope, the  
15          level of detail, and plans representation.

16          Demonstrate the PRA has been developed and  
17          used in a technically acceptable manner and identified  
18          application-specific acceptance criteria and  
19          demonstrate they have been met.

20          Section C4, the next slide, please, 35.

21          Documentation to support a regulatory  
22          decision, in Section C4, documentation of the PRA  
23          milestone and the analysis confirmed or should confirm  
24          that appropriate information, those that are visible  
25          for the staff audit inspection and submit the

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1 information, submit it in the application.

2 Note that the archival PRA documentation  
3 may be required on an as-needed basis to facilitate  
4 the NRC Staff's review of the application.

5 Slide 36. In the Reg Guide, we  
6 specifically list the information and there's a PRA  
7 documentation. I will not go over these bullets.  
8 Next, please, Slide 37.

9 We also listed in the reg guides the  
10 submit the PRA documentation should be included in the  
11 application. Slide 38, now the Appendix A that the  
12 Staff position and Section C2 on PRA peer review  
13 process.

14 Before getting there, I'd like to show you  
15 the bigger picture. About 80 percent of the  
16 requirements in the non-standard PRA standard was  
17 taken as if from the LWR PRA standard.

18 Secondly, during the first consideration  
19 ballot of the non-standard PRA standard, NRC Staff  
20 submitted 489 comments presented a set of Staff  
21 reviews and perspectives.

22 During the recirculation ballot, NRC Staff  
23 submitted additional 70 comments included a mix of  
24 proposed technical transitions and observations  
25 related to the regulatory issues.

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1                   Next please, Slide 39. Similar to Reg  
2 Guides 1.200, the start position on each requirement  
3 in the non-standard PRA standard is classified as no  
4 objection with clarification and no objection subject  
5 to the following qualification that the Staff provide  
6 this position.

7                   Next please. Slide 40, here are some key  
8 rationales for the Staff position. During the  
9 recirculation ballot, about 70 NRC comments, JCNM  
10 decided that.

11                   About 20 comments need to be addressed in  
12 the light water reactor Level 1 PRA standard first but  
13 not in the non-standard UA PRA standard yet. About 8  
14 comments were considered as regulatory issues and was  
15 not addressed in the non-standard PRA standard.

16                   Other rationales include mute issue found  
17 after the ballot. Issue was not addressed, adequately  
18 addressed, during the ballot. Issue was not fully  
19 addressed by JCRMs.

20                   And nearly habits for consistencies with  
21 the start position and Reg Guide 1.200 Revision 3.  
22 Next please. Slide 41.

23                   This slide shows that in Appendix A of Reg  
24 Guides 1.246 there are 147 Staff positions, 114 are  
25 classification and 33 are qualification. In the

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1 non-LWR PRA standard, there are 214 high-level  
2 requirements and 1233 supporting requirements.

3 In addition to that, the language provided  
4 in the definition section and other sections show that  
5 Staff has about 10 percent position so in general, we  
6 believe that we're not much far away from each other.

7 Next please. Slide 42. Out of these 147  
8 positions, the Staff identified 17 of them, more  
9 substantive and binned them into five groups.

10 Group 1, low-power and shutdown risk  
11 issue, Group 2, external hazard, Group 3, ever  
12 Commission, Group 4, risk significance, Group 5,  
13 reporting requirements. Next please. Slide 33.

14 MEMBER BLEY: Hanh?

15 MR. PHAN: Yes, sir?

16 MEMBER BLEY: I just wanted to comment,  
17 this is my personal opinion, when I first got the reg  
18 guide and saw the large number of these, I was  
19 concerned we had maybe a real disconnect between the  
20 Staff and the standard.

21 But after I read them carefully, I'd  
22 rather than appreciate almost all of your  
23 clarifications and qualifications, I thought they were  
24 important and I congratulate you on those, but go  
25 ahead.

1 MR. PHAN: Thank you, that's what we are  
2 here for, not try to convince anyone to accept where  
3 we are but hopefully, you agree with the Staff's  
4 position and everything we have in the documents up to  
5 this point.

6 Next please. So, Group 1, low power and  
7 shutdown risk. In this first group regarding low  
8 power and shutdown, the Staff expects that low power  
9 and shutdown types of evolutions should be addressed  
10 for all stages of the licensing process.

11 That's shown in the POS note to and for.  
12 In addition to that, to avoid including potentially  
13 significant contributors to risk, the stop of  
14 capability in POS is one requirement, that should be  
15 the same as the scope of the Capability 2 requirement.

16 So, we combined those into one  
17 requirement. Furthermore, in POS-B1, the last row, to  
18 ensure that the POS grouping, this impacts significant  
19 event sequences.

20 Additional requirements, Item C in the  
21 last row, the last column, was added to the Capability  
22 one.

23 Group 2, next slide, Slide 44, external  
24 hazards, risk. For seismic facility analysis, SFR-C1  
25 and C2, in addition to specifying the basis for

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1 screening of components and achieving the facility  
2 thresholds, the Staff adds to the requirement the  
3 justification for those selected basis in the hazard  
4 screening supporting requirements as X-A3.

5 The requirements do not specifically  
6 mention hazard, therefore, the Staff added that term  
7 to their requirement. The last one, high winds, the  
8 Staff believes that the 150 most distant mentioned in  
9 the supporting requirements, A-A5, is a bit churly.

10 Therefore we replaced that with the term  
11 sufficiently far away. Next please. Regarding the  
12 seismic hazard analysis, supporting requirements SA-  
13 P5, this does not include the use of the existing  
14 probabilistic SA for a site.

15 The impacts of an updated catalog on the  
16 use of the existing probabilistic SSA, therefore, the  
17 Staff adds the requirement on the demonstration that's  
18 updated catalog of upgrades.

19 It does not make the existing  
20 probabilistic variable. For hazard screening, the  
21 Staff deletes Item F from supporting requirements best  
22 B5. In the preferences there's a 5 on the reporting  
23 values, not the screening values.

24 Next please, Slide 46, errors of  
25 commission. In this Group 3 the Staff adds to the

1 human reliability element under high-level  
2 Requirements E and supporting Requirements HR-E4.

3 The consideration of errors of Commission.  
4 Next please. Slide 47, the risk significance for that  
5 the Staff adds additional clarification to note N-1,  
6 regarding the proper use of relative and absolute risk  
7 significance.

8 You can see that in the last column and in  
9 this column, these are all the Staff language. Next  
10 please. Slide 48. In Group 5 reporting requirements  
11 the Staff does not consider reporting as one of the  
12 PRA requirements.

13 When determining the PRA acceptability for  
14 an application, the Staff concluded that should  
15 supporting requirements should be provided by the  
16 appropriate regulatory authority on an application-  
17 specific basis.

18 Next please, Slide 49.

19 MEMBER BLEY: Hanh?

20 MR. PHAN: Yes?

21 MEMBER BLEY: I'd like to interrupt you at  
22 this point with a couple of comments and a question.  
23 The first comment is in several places in your  
24 resolution, you speak of credit or do not credit a  
25 human failure event and a PRA and I want to suggest to

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1       you that you change that language.

2               I think it ought to say include the HFE  
3       and the PRA and the reason I don't like your use of  
4       the word credit is it's left over from traditional  
5       safety analysis.

6               And I think to a lot of people who read  
7       this who aren't extraordinarily familiar with PRA,  
8       they will read it as saying you assume the operator  
9       will do it correctly, you credit the operator action.

10              And I think that language is going to get  
11       you complaints that you don't need and complaints that  
12       aren't really on target. So, I really hope you'll  
13       think about changing that.

14              I made a comment in my opening remarks  
15       about the search for initiating events and I hope you  
16       consider that as well. On your FLPP B6, but it  
17       happens many other times, you talk about, this one is  
18       about, internal flood partitioning.

19              Do it via walk-downs, which is a great  
20       idea, but if you can't do a walk-down, you can't do  
21       it.

22              And I wonder, this is a question, you're  
23       decades past designers and even licensees who would  
24       build full-scale 3D models of their plant so you could  
25       look at some of these issues at least preliminarily.

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1           You'd have to reconfirm as built. But I  
2           suspect now most of them have 3D computer models, they  
3           don't build the big models anymore, where you could do  
4           some of this at least in a preliminary sense. Have  
5           you thought about that?

6           It shows up in quite a few places where  
7           you can't do it because the plan isn't there but if  
8           you have those 3D models you could at least confirm  
9           there's a potential problem. As long as it's built to  
10          look like the 3D model, you don't have a problem.

11          MR. PHAN: Thank you for your advice.

12          In the interim start guide 28 for light  
13          water reactors license application, we told the  
14          Applicants that for plants walk-down, because of the  
15          early stage of the design, the Staff mostly affect the  
16          paperwork is that during the year.

17          But yes, which technology improvements we  
18          may have more revisions on site and we can have more  
19          information contributing to the decision-making.  
20          Thank you, yes, we will consider that.

21          MR. VASAVADA: This is Shilp Vasavada from  
22          the NRC Staff, can I make a comment here?

23          MR. PHAN: Please do.

24          MR. VASAVADA: This is again Shilp  
25          Vasavada and to your point, I think it was Member

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1 Bley, Step 7C in I think Section 5 of 2009 does  
2 accommodate those types of information in lieu of  
3 lock-down for certain stages of plant construction and  
4 development.

5 I'll quote directly, peer review is for  
6 PRAs in the design and/or pre-operational phases, can  
7 rely on computerized walk-downs. It is important that  
8 peer reviewers identify assumptions, example  
9 configurations of SSCs.

10 And that is for operators that impact  
11 and/or have been used in the PRA development. The PRA  
12 reviewers would confirm the consistency of the  
13 assumptions with the PRA during the review of the  
14 relevant technical and documentation SR, end quote.

15 MEMBER BLEY: Thank you very much. When  
16 I read that and saw computerized walk-downs, I just  
17 envisioned a spreadsheet where you kept track of  
18 things and I didn't get the sense you were talking  
19 about 3D models.

20 But if you were, that's great and if you  
21 added clarity, that would be even greater but thank  
22 you for filling me in on that.

23 MR. VASAVADA: Thanks for that, we'll take  
24 that back about additional clarity. Thank you.

25 MR. PHAN: Please go to Slide 48, thank

1 you. 49, thank you. NEI's 2009, the Staff received  
2 the initial document on June 1, 2020. The Staff  
3 reviews observations to NEI during the public meeting  
4 on July 22, 2020.

5 We received another revision of this  
6 document latest August last year. We provided  
7 additional comments in another public meetings on  
8 October 26th of last year.

9 With all of that, NEI submitted to us the  
10 revision of NEI 2009 on May 5, 2021, which addressed  
11 most of the Staff's feedback on the guidance. That's  
12 just some background for your information. Next  
13 please, Slide 50.

14 So, 2009 revision was based on a similar  
15 guidance document. NEI 1707, Revision 2, which we  
16 endorsed in Reg Guide 1.200, Revision 3. So, NEI 2009  
17 addresses radios plus courses hazards, POS, and  
18 therefore PRA analysis.

19 And the process in that guidance is  
20 applicable for peer reviews confirmed for a PRA at any  
21 stage of the plant's lifecycle. The Staff finds the  
22 reg guidance in NEI's 2009 Revision 1 is acceptable.

23 So, we endorsed 2009 without exception in  
24 Section C.2.2 of Reg Guide 1.247. It should be noted  
25 that the non-standard PRA standard also contains

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1 requirements for the performance of acceptable peer  
2 review process.

3 The Staff also reviews those requirements  
4 and has no exceptions to them. Next, please. This is  
5 my last slide. NEI's place to bylaw the peer review  
6 process so the Staff hopefully to observe the bylaws.

7 And based on the observations, we may  
8 enhance the start position in Reg Guide 1.247. So,  
9 with that, I would turn to Mr. Marty Stutzke to go  
10 over some non-standard PRA acceptability issue.

11 Please take over, Marty.

12 MEMBER BLEY: Marty, how long do you think  
13 your set is going to take?

14 MR. STUTZKE: Ten minutes.

15 MEMBER BLEY: Go ahead.

16 MR. STUTZKE: Very fast. So, there were  
17 ten issues identified in our white paper, I've listed  
18 the references here.

19 And as Michelle had said before, we either  
20 addressed them in Reg Guide 1.247 or they're being  
21 addressed in other guidance. Or we're doing some  
22 research activities.

23 Slide 53. So, the first issue is  
24 providing guidance on initial licensing. Remember the  
25 model that Reg Guide 1.247 is a basis for all PRAs and

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1 then there would be application-specific regulatory  
2 guidance.

3 And the focus has been on the industry  
4 TICAP guidance and its endorsement and the Staff's  
5 event or after content of application, ARCAP guidance,  
6 et cetera. So, that's the example of the specific  
7 application regulatory guidance.

8 We're not currently developing any non-  
9 LMP-based guidance at this time. Item 2 on graded  
10 PRAs. We have a working group formed to explore  
11 alternatives to PRA that should achieve the same  
12 underlying purposes.

13 To give you a flavor of what we're looking  
14 at, perhaps we could adapt the integrated safety  
15 assessment process required for Part 70 licensees, we  
16 have NUREG 1513 which provides guidance on developing  
17 that.

18 And I understand that the SHINE  
19 application has modified that in lieu of performing a  
20 PRA. So, there may be some possibilities there.  
21 Issue Number 3, guidance on voluntary risk-informed  
22 applications.

23 We've initiated work requests. This is  
24 basically going to either be an upgrade of things like  
25 Reg Guide 1.74 or a parallel document applicable to

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1 non-LWRs.

2 The big question at least in my mind is  
3 adapting the numerical risk acceptance guidance from  
4 core damage frequency and large early release  
5 frequency to something that is more technology-  
6 neutral, perhaps the QHs directly.

7 We'd already talked about Item 4, about  
8 the use of risk surrogates and the language in Reg  
9 Guide 1.247 allows them. The question, then, about  
10 the use of seismic margins analysis, that's not  
11 addressed specifically in the standard.

12 We feel obliged to address it in our  
13 regulatory guidance because the Staff requirements  
14 memorandum on SECCY-93-087 allows the use of seismic  
15 margins analysis.

16 And of course, to employ SMA you need to  
17 have a risk surrogate, something like large release  
18 frequency or something.

19 So, anyway, anybody that wants to use  
20 seismic margins is encouraged to talk to us during  
21 pre-applications. Slide 54, please.

22 MEMBER BLEY: Marty?

23 MR. STUTZKE: Yes?

24 MEMBER BLEY: On Item 2 up there and if  
25 this is politically inappropriate to answer that's

1 fine, but if you can I'd appreciate some information  
2 and maybe when Victoria Anderson makes her comments  
3 later she'll touch on this.

4 We hear stories and we've had  
5 presentations by people who think for their reactors  
6 a PRA is just way too much overhead and too costly and  
7 on and on.

8 We also hear stories and see things where  
9 some developers have come up with what they found to  
10 be a reasonable approximation to a full PRA but  
11 limiting the areas where they can bound off  
12 consequences.

13 So, we're getting a real mix of way too  
14 hard and it works just great. Have you heard anything  
15 along the way along those lines?

16 MR. STUTZKE: My impression from sitting  
17 in on a variety of public meetings related to Part 53  
18 is the industry is not speaking with a single voice  
19 here.

20 Some people are greatly wedded to LMP and  
21 the use of PRA and they're all the way at the other  
22 end of the spectrum, people just don't see the benefit  
23 of doing it.

24 So, we're trying to be accommodating.  
25 Thinking about it in terms of either PRA is a leading

1 role that would be used to support things like LMP, or  
2 PRA in a more traditional role where the purpose of  
3 the PRA is to confirm a deterministically-based  
4 design, look for outliers or something that was missed  
5 or something.

6 And the third option that we're looking  
7 at, we call it the dose-consequence-based alternative  
8 and that would pick up on things like integrated  
9 safety assessment, we're looking at some OSHA  
10 regulations and some EPA regulations that seem to be  
11 similar.

12 They reference a document by the Center of  
13 Chemical Process Safety of the American Society of  
14 Chemical Engineers on these techniques. So, we're  
15 trying to be accommodating of all anticipated  
16 Applicants.

17 MEMBER BLEY: Thanks.

18 MR. STUTZKE: It's an enormous problem.

19 MEMBER BLEY: I really appreciate your  
20 comments and we look forward to hearing more about  
21 that in some other meeting in the future.

22 MR. STUTZKE: Slide 54, please.  
23 Completeness, certainty, we've initiated some work  
24 requests in the Office of Research concerning  
25 uncertainty analysis in general and the low-power

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1 shutdown fire PRA.

2 I wanted to point out that there is an  
3 existing NUREG CR-7114 that provides a framework for  
4 doing low-power shutdown fire PRA.

5 It tends to be qualitative in nature, at  
6 least my vision is we'll end up with something that is  
7 analogous to NUREG CR6850 which will be a more  
8 complete quantitative methodology. But that will take  
9 some time.

10 Item 7 about selecting a bounding site,  
11 the notion there is you have to design the reactor for  
12 the worst possible seismic hazard and the worst  
13 possible hurricane hazard, et cetera.

14 And you ended up rapidly with a site  
15 that's not physically realistic. So, we've allowed  
16 each Applicant to propose and justify on a  
17 case-by-case basis what their bounding site is.

18 Item 8 is the notion that various  
19 supporting requirements apply during different  
20 licensing stages. In other words, they contain  
21 qualifiers like prior to operation or during  
22 construction, et cetera.

23 So, the requirement would apply. So, I  
24 think of it as the supporting requirements turn on and  
25 turn off at various stages and we wanted to try to

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1 make that explicit to relate the more broad language  
2 that's used in the standard to specific licensing  
3 stages as the NRC recognizes.

4 For example, construction permits and  
5 operating licenses, design certifications,  
6 manufacturing licenses, standard design approvals,  
7 versus combined license versus the fuel load PRA, et  
8 cetera.

9 Our intent is to build an interim Staff  
10 guidance document to be very specific as to which  
11 requirements apply when.

12 Item 9, the use of absolute relative risk  
13 significance criteria. We've addressed it in the reg  
14 guide and the next three slides talk about this in  
15 some detail.

16 We've also talked previously about Item  
17 10, the use of peer reviews. Notice that they can be  
18 full scope or focused scope to demonstrate the  
19 acceptability of the PRA.

20 A couple of points I would make about peer  
21 reviews.

22 One is a concern about the lack of  
23 qualified peer reviewers for non-LWRs makes it  
24 difficult and there are concerns that have been  
25 expressed by some reactor designers about their desire

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1 to maintain their proprietary information proprietary.

2 And so they're therefore discouraging of  
3 peer reviews. I would point out that the Staff also  
4 has the option to conduct a PRA audit where we will go  
5 on site to an Applicant's office and look in detail at  
6 the PRA and put in all the logic models, all the  
7 supporting data, et cetera.

8 So, my personal impression or opinion is  
9 if an Applicant does not want to do a peer review for  
10 one or the other, then we will do one for them and  
11 they can expect the corresponding increase in the  
12 schedule of getting the SER completed.

13 Slide 55. Risk significance. In general,  
14 it's used for a couple of reasons like this. The goal  
15 or outcome is to at least identify what's important.

16 It's used in construction of a PRA where  
17 there are specific requirements that says the risk-  
18 significant items do, for example, X, Y, and Z so you  
19 need to wait to be able to determine to which items  
20 those apply.

21 And items can be things like basic events,  
22 any one of the technical elements like that.  
23 Personally, I've always used importance measures as a  
24 tool to debug the logic models, looking at symmetry  
25 across the trains.

1           One would expect the importance measures  
2           to be similar or identical. And of course, it's an  
3           iterative process. The second use of risk  
4           significance is in reporting PRA results, what we  
5           actually get to look at.

6           The more traditional approach is to use  
7           relative risk significance where you're being measured  
8           and normalized to the total risk. In contrast to  
9           absolute risk significance, you're normalizing to a  
10          specific risk target.

11          For example, the LMPs frequency  
12          consequence target curve or the QHOs.

13          Think of it like this, if I take some  
14          measure of importance and I rank order the list of  
15          basic events that come from the PRA, what we're  
16          discussing here between relative versus absolute risk  
17          significance is where to draw the line on that very  
18          long list.

19          And the items above the line would be  
20          significant and the items below the line not as  
21          significant. So, these are just two different ways of  
22          deciding where to draw the line on the list.

23          If you'll flip to Slide 56 I'll give you  
24          an example.

25          So, this is basic events risk significance

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1 and the relative process, the traditional process will  
2 use the vessel importance measure greater than 0.005,  
3 the risk achievement, the raw value greater than 2 to  
4 identify risk significant basic events.

5 In contrast, what is proposed in the  
6 standard that we've accepted without clarification or  
7 qualification would say on an absolute basis, a basic  
8 event is significant of increase of 1 percent to any  
9 identified target or if the basic event is assumed to  
10 fail you would exceed the criteria, exceed the target.

11 So, you can begin to see these are similar  
12 in flavor but they greatly reduce the number of risk-  
13 significant items. Slide 57, I've given an example of  
14 risk-significant event sequences or event sequence  
15 families.

16 What we've always done using relative is  
17 to say anything that contributes 95 percent or  
18 anything that individually contributes 1 percent by  
19 itself like this.

20 Whereas, in contrast on the absolute, the  
21 percentages are relative to the absolutely risk  
22 target.

23 With that, I believe I'm done.

24 MEMBER BLEY: Thank you very much, Marty,  
25 we appreciate the presentation and discussion. Do any

1 members have anything for Marty before we switch over  
2 to the standards group?

3 Okay, at this time I'm going to go to Karl  
4 Fleming of the JCNRM for his presentation.

5 Before we do, I just wanted to announce to  
6 everyone that Karl was awarded the 2021 American  
7 Nuclear Society prestigious Tommy Thomson Award for  
8 lifetime contributions to the field of nuclear safety.

9 Karl, our congratulations. As you talk,  
10 any of the things we brought up earlier with the Staff  
11 that you want to comment on, we would appreciate it  
12 and I guess your talk is future activities.

13 So, we're interested in whether you were  
14 surprised by the reg guide or not and whether you or  
15 the group expects that there will be a revision within  
16 a couple of years on this standard.

17 Karl, please go ahead.

18 MR. FLEMING: Thank you very much, Dennis.  
19 I appreciate your congratulations.

20 If we can go on to the first slide,  
21 please. The next slide.

22 Yeah. This is just my personal opinions.  
23 This is the result of a first look at the Reg Guide.  
24 I'm sure I'll have more to say once I do a more  
25 careful review. These are my personal views, and do

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1 not reflect any official position of JCNRM.

2 Next slide, please.

3 I don't have enough time to go through all  
4 the bullets here, but there's some background here  
5 that lays out the process we followed to get this  
6 thing balloted through two recirculation reviews.

7 Some key points I wanted to make here was  
8 that our disposition of the first round and second  
9 bound ballot reviews that we got from the NRC, when we  
10 got to the end the NRC agreed with our unanimous  
11 decision to publish this standard based on the way we  
12 had dispositioned all those comments.

13 Yes, on one of your questions, Dennis, I  
14 was a little bit surprised to see so many  
15 clarifications and changes at the end. However, I've  
16 done a little bit of analysis of the breakdown of  
17 those, which I'll comment on later, which I think  
18 brings out some important points.

19 But I wasn't party to reviewing the Reg  
20 Guide on -- Reg Guide 1.200, but I was a little bit  
21 surprised to see the method by which the  
22 clarifications are presented in a form of a markup of  
23 the document. And I guess if I were doing it, I would  
24 rather, given the fact that the standard says what it  
25 says, the requirements are basically written down in

1 the standard, which has been unanimously approved.

2 I think it would be more useful to have  
3 the staff say how they expect these requirements to be  
4 met in terms of how they express clarifications. But  
5 I know there's a Reg Guide 1.200 precedent here.

6 So, let's go on to the next slide, please.

7 One thing I wanted to sort of nail down  
8 here, I think it's contrary to the discussion by  
9 Anders and some of the other commenters so far. This  
10 standard does not support the use of surrogate risk  
11 metrics, period, full stop. We do, we do talk about  
12 the user can define intermediate states like, for  
13 example, a core damage state if he wants to define  
14 what he or she wants to define on.

15 But we do not support stopping at a  
16 surrogate spot in the model and expressing results in  
17 that term. All the risk characterization, risk  
18 significance determination and everything is all part  
19 in our risk integration element. And they all relate,  
20 they all include, relate to a quantification of the  
21 frequencies and radiological consequences of event  
22 sequences and --

23 MEMBER BLEY: Karl.

24 MR. FLEMING: Yes?

25 MEMBER BLEY: If I could. When I heard

1 Anders speak I think he, he expressed it in the same  
2 terms you did, as intermediate points.

3 MR. FLEMING: Yes.

4 MEMBER BLEY: Hanh had spent a lot more  
5 time talking about surrogates.

6 And I understand your point. And they'll  
7 help us.

8 Go ahead.

9 MR. FLEMING: Yeah. Anyway, so, so anyway,  
10 we really don't have surrogate risk metrics as risk  
11 metrics.

12 On sections C.1.3 and C.1.4 I look at it  
13 as sort of paraphrasing what's in the standard. But  
14 this paraphrasing was in different language, and many  
15 things were left out. Rather than try to cover the  
16 same ground that's in the standard in terms of  
17 objective, attributes, and so forth, it would be more  
18 useful to focus on what the staff wants to clarify.  
19 Because in those sections I would have to do a lot of  
20 analysis to try to find out what's different and  
21 what's left out and so forth between those.

22 Let's see. A lot of the clarifications  
23 sin Appendix A refer to items that are shared with the  
24 supporting standards.

25 And I want to make a, I think, a very



1 important point. One of Hanh's slides broke down the  
2 clarifications by technical element. And those of us  
3 that, you know, were involved in the standards, the  
4 most -- the elements where the non-light water reactor  
5 changes were most significant were in initiating  
6 events, event sequence analysis, event sequence  
7 quantification, and mechanistic source terms, and risk  
8 integration. That's where the stuff that's really  
9 different about this standard and the LWR standard  
10 reside.

11 There were zero comments on IE-ES  
12 quantification and mechanistic source terms, and only  
13 two comments or clarifications on risk integration,  
14 which just have to do with reporting.

15 MEMBER BLEY: Karl.

16 MR. FLEMING: Yes.

17 MEMBER BLEY: I don't want to interrupt you  
18 again, but this is more functional. As soon as I'm  
19 done speaking, Dave Petti will take over chairing this  
20 session.

21 I appreciated the things you just said.  
22 And I think the staff might make some notes here. I  
23 know they're trying to be parallel to 1.200, but  
24 they've written a new Reg Guide. And the idea that  
25 rather than changing the words in the standard they

1 are saying here's what you need to do to meet the  
2 standards requirement in our view, I think is probably  
3 a more correct way to phrase things. So, I hope  
4 they'll think about that.

5 MR. FLEMING: Right.

6 MEMBER BLEY: I won't get in your way  
7 anymore. Please, go ahead.

8 Oh, the last thing is, and this is for  
9 Dave, too, although our agenda says the meeting ends  
10 at 12:30 Eastern Time, our overall schedule shows we  
11 had to block all the way to 1 o'clock. So, we can  
12 keep going past 12:30 if need be.

13 But go ahead. Thanks, Karl.

14 MR. FLEMING: Yeah, thanks.

15 And along those lines, so, I haven't done  
16 the analysis of the, of the 147 comments. Only two  
17 relate to the technical elements where the non-light  
18 water reactor meet is. I suspect that the vast  
19 majority of the 145 remaining clarifications are  
20 really comments that are shared with language in the  
21 LWR standard as well as the non-light water reactor  
22 standard.

23 I think it would be helpful in the revised  
24 Reg Guide if the staff could sort of focus on, or at  
25 least identify which of the clarifications are really

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1       either unique to non-light water reactors or have  
2       unique significance to non-light water reactors,  
3       because that would affect the way the Standards  
4       Committee will manage them.

5               MEMBER BLEY: It's Dennis again. I wanted  
6       to get in one question to you.

7               We talked with the staff a bit about do  
8       you envision eventually there just being one standard?  
9       And I know the standards process is trying, so I don't  
10      know if that's ever going to pass. But it sure seems  
11      like a reasonable end point to hope for.

12              MR. FLEMING: Yeah. My personal view is,  
13      you know, our, our standard is technology-inclusive.  
14      There's no reason why it couldn't be used on any  
15      reactor. But the JCNRM position is we have a separate  
16      standard for light water reactors, so we try to steer  
17      this and emphasize the "N" in the non-light water  
18      reactor standard. That's the JCNRM position. We have  
19      separate standards.

20              But technically speaking, I think we could  
21      make this a standalone standard for all reactors if we  
22      wanted, if we decide that we wanted to do that.

23              If we can go on to the next slide, please,  
24      on some specifics.

25              You know, I just wanted to make a comment.

1 But I think that the way technical adequacy is talked  
2 about versus technical accept -- PRA's acceptability,  
3 I think the differences are a bit more profound than  
4 indicated in the Reg Guide.

5 PRA technical adequacy is basically based  
6 on a consensus international standard that the NRC  
7 participates in. PRA acceptability is really reflects  
8 the position of one regulatory body for regulatory  
9 applications. I think they're rather fundamental  
10 differences in those terms. So, the suggestion that  
11 they're semi-synonymous I think is a little bit  
12 misleading.

13 There's, you know, in replaying what's in  
14 the non-light water reactor standard some of the  
15 paraphrasing is inaccurate. Table 1 really is better  
16 represented by Table 1.4-1 in the standard.

17 So, the purpose of paraphrasing things and  
18 then leaving things out is a little bit unclear to me.

19 I just wanted to also clarify that with  
20 regard to the Figure 1 triangle figure in the Reg  
21 Guide, you know, the technical requirements for peer  
22 review are actually part of the standard. You can't  
23 really meet the standard fully without meeting the  
24 technical requirements for the peer review. Whereas,  
25 the NEI guidelines is a guidance for how to do the

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1 standard.

2 We try to leave the standard for what to  
3 do rather than how we do it. So, just wanted to  
4 clarify that.

5 In the paraphrasing --

6 MEMBER BLEY: Could you take another  
7 comment? Let me sneak another one in.

8 MR. FLEMING: Please, yes.

9 MEMBER BLEY: Yeah. As I study the staff's  
10 clarifications and qualifications, for I would say 90  
11 percent of them I think if I were reading the standard  
12 I would expect what they said. And I, you know, it  
13 really is at this point it's them clarifying what one  
14 needs to deliver to them for them to be satisfied that  
15 the standard's met for most all of the comments.  
16 That's my opinion.

17 MR. FLEMING: Yeah. And I think what, as  
18 long as that's understood, I think that's well taken,  
19 the point's well taken. And that's why if I were, if  
20 I were doing the Reg Guide, if I were working on the  
21 Reg Guide I would try to not express the  
22 clarifications in the form of a markup.

23 I just think it's -- it seems to suggest  
24 that we need to go back and change the standard right  
25 away. And we're not going to be able to do that for

1 some time, which I'll get to in a second.

2 So, you know, in the paraphrasing up in  
3 C.3, C.1.3 and C.1.4, you know, for example the  
4 material on plant operating states and mechanistic  
5 source terms and other kinds of things that are in  
6 there don't really seem to bring out a very, very  
7 important distinction there in the standard is that  
8 the event sequences are expected to characterize event  
9 sequences that may involve multiple reactors or  
10 multiple sources. And that doesn't seem to be  
11 emphasized there much.

12 For some reason the Reg Guide looks at  
13 documentation just as one section at the end, whereas,  
14 we have very specific documentation requirements for  
15 each of the technical elements. So, that's a little  
16 -- the bottom line is that if someone didn't go  
17 through the standard and looked at the front matter in  
18 the Reg Guide to get an idea what's in the standard I  
19 don't think they get a very good appreciation of  
20 what's in the standard.

21 And I'm a little bit sensitive to that  
22 because I was involved in leading the group that  
23 developed the standard.

24 On the two comments or clarifications that  
25 were made on risk integration where the staff has

1 deferred their commentary on that to specific  
2 applications, I just wanted to say that we believe  
3 that these are more fundamental issues. The reporting  
4 requirements A.4 and A.5, A.4 talks about, you know,  
5 reporting low frequency events, and A.5 comes talks  
6 about radiological consequences that are really not  
7 that significant because they're, you know, way less  
8 than background radiation effects.

9 And we think that these are pretty  
10 fundamental. And these come from feedback we got from  
11 our pilot studies, especially the pilot study on  
12 PRISM, where, you know, the direct application of the  
13 trial use standard that we had led them to calculation  
14 10 to the minus, you know, umpty-scrump frequencies  
15 and, you know, 10 to the minus 27 latent cancer  
16 fatalities and so forth. And so we put that in there  
17 but recognize the limitations of PRA technology.

18 And I want to go back to something that I  
19 know Dennis was in the room several times when Norm  
20 Rasmussen would come to PLG when he was on the board  
21 of directors. And I heard Norm say at least four or  
22 five times that the biggest mistake he made when he  
23 published the results of WASH-1400, the Reactor Safety  
24 Study, is agreeing to put numbers in there, the curves  
25 down there that went all the way down to 10 to the

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1 minus 9 per reactor year. So, that was way beyond the  
2 limit, capabilities of PRA technology.

3 So, I think that we believe that those  
4 reporting requirements are, you know, important  
5 recognitions that PRA technology is limited. And I  
6 think that would be true for any application. And my  
7 colleague Dennis Henneke has some more specific  
8 comments on the specific, you know, clarifications and  
9 findings in Appendix A.

10 I have one slide remaining before I turn  
11 it over to Dennis on the plans for future changes.

12 So, per direction from the standard  
13 writing organization, the standard organization, Jason  
14 Ramm, our schedule for the next addition has some  
15 constraints on it. We need to wait until all the  
16 supporting LWR standards are in alignment with the  
17 next edition, which has recently been balloted, and  
18 hasn't even been published yet. And I know when the  
19 next edition of the LWR standard is published there  
20 will be, there will be editorial revisions, you know,  
21 made during that process.

22 So, the low power shutdown standard, the  
23 Level 2 standard, Level 3 standard, and the advanced  
24 LWR standard, and more recently we've started a multi-  
25 unit PRA standard for light water reactors, all of

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1 those standards really need to be taken to the level  
2 where they're in agreement with the next edition of  
3 the LWR standard before we can even start.

4 MEMBER BLEY: Karl.

5 MR. FLEMING: Yeah. Yes?

6 MEMBER BLEY: If you can, if you can say a  
7 little more about the multi-unit one, I think the  
8 committee would be very interested.

9 And the second part is are you considering  
10 or do you even think it would be necessary if the  
11 staff goes ahead with its initiative for graded PRA to  
12 have a standard that addresses possible approaches  
13 there?

14 MR. FLEMING: Right. Okay, so the multi-  
15 unit, there was a -- there's a lot of background here,  
16 but we included multi-unit PRA requirements in the  
17 non-light water reactor standard. And we also at one  
18 time had planned on having a non-mandatory appendix to  
19 the light water reactor standard that addressed multi-  
20 unit issues. This is one of the things that we  
21 decided to do after the Fukushima accident.

22 And there was some controversy and some of  
23 the members with Jason Ramm were a little bit nervous  
24 about that. I guess there was a concern that if they  
25 put that out there then they'll be required to do one,

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1 concerns like that that arose.

2 Eventually the decision was made to launch  
3 a writing group to develop a trial use multi-unit PRA  
4 standard. And so that there's a working group working  
5 on that. And there are a good cross-reference of  
6 people. There's people from the NRC staff that are  
7 working on the Level 3 PRA project. And the IAEA's  
8 involved.

9 So, that, that's working in process. And  
10 it has some of the same requirements. I mean, the  
11 draft that we have has some of the same types of  
12 requirements that we have in the non-light water  
13 reactor standard, but it's a work in process right  
14 now.

15 But if there are new multi-unit issues or  
16 requirements that come up in that effort, we certainly  
17 want to recommend to account in the next edition of  
18 the non-light water reactor standard.

19 But the second big bullet on this slide I  
20 wanted to make a comment is that several years ago we,  
21 all the input that we needed from the non-light water  
22 reactor pilots, we had a lot of pilot studies that  
23 were based on the trial use non-light water reactor  
24 standard. And the lessons learned from those were  
25 pretty incorporated into the preparation of this

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1 standard a couple years ago.

2 So, the last couple of years most of the  
3 resources, and a tremendous amount of resources had to  
4 go into this thing to result in some 500 pages after  
5 it had been focused down to a PDF file, the vast  
6 majority of our work has been to get language  
7 alignment with the LWR standards.

8 And the problem has been is that we put  
9 this one ahead of the next edition schedule, so we had  
10 to work real hard to get, you know, to adapt to all  
11 those changes.

12 But the one thing that we need to consider  
13 very, very seriously in the next edition is that we  
14 need to give the non-light water reactor standard some  
15 opportunity to use this standard in their ongoing  
16 applications. There's a lot of users out there using  
17 this standard today, but there's lots of parts of this  
18 standard that haven't been exercised very much.

19 So, we need to think in terms of giving  
20 the non-light water reactor community an opportunity  
21 to see what their needs are so this thing isn't just  
22 driven by LWR alignment issues like it's been for the  
23 last two years.

24 So, we don't know what the schedule is.  
25 It's going to be a while before the next edition of

1 the standard comes out. And we can't schedule it in  
2 the non-light water reactor writing group because we  
3 don't know when these other prerequisites are going to  
4 be satisfied. It's probably going to be several  
5 years, I would guess.

6 As far as the, as far as the graded PRA  
7 applications are concerned, this standard could be  
8 useful to support some of those applications. But we  
9 did not specifically design the standard to support  
10 any of the ideas that are out there about graded PRA  
11 applications.

12 I don't know whether there's a good single  
13 definition of what that is. I think there's a lot of  
14 different ideas about how to, how to grade a PRA. But  
15 I would like to say that with regard to the pros and  
16 cons of doing PRA for simple reactors or whatever, I  
17 think we're stuck. You know, because we've aligned  
18 ourselves with the LWR standards, we end up with a big  
19 monster of a 500-page set of technical requirements.  
20 Most of the size of that standard is driven by the  
21 number of requirements that have come in from the LWR  
22 world.

23 However, I do believe, and I, you know,  
24 the work I've been doing to support some of the  
25 modular HTGR concepts that are out there, that the

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1 scope and level of detail of a PRA that meets the  
2 standard is really completely correlated to the level  
3 of detail and complexity of the plant.

4 And while there's a big document out there  
5 that is maybe burdensome to apply to support your PRA,  
6 you don't necessarily end up with a very large PRA  
7 model itself. And that's why we wrote the event  
8 sequence requirements in the standard to go all the  
9 way from initiating events to -- with one event  
10 sequence model that goes all the way to radiological  
11 consequences.

12 So, anyway, I don't think you necessarily  
13 have to have a big, multiplied, you know, bookshelf  
14 PRA document to meet the standard. If you have a  
15 simple reactor, the PRA model should be simple.

16 So, that's pretty much all I had to say  
17 here today. And I wanted to leave time for Dennis to  
18 fill in some more specifics.

19 MEMBER PETTI: Okay, thanks.

20 I know we're running late and we need to  
21 allow public comment and other members. So, Dennis,  
22 I see there's about ten slides left between yours and  
23 the closing remarks. So, let's see if we can, you  
24 know, get done by 45 after or 50 after the hour.

25 MR. HENNEKE: Okay. Yeah, we'll give it a

1 shot.

2 I'm Dennis Henneke. Many of you know me.  
3 I'm the American Nuclear Society Chair for JCNRM,  
4 which develops and maintains all the standards that  
5 Karl has talked about.

6 We have not gotten formal feedback from  
7 the JCNRM, so I'm not representing the JCNRM or GE or  
8 any others, it's just my feedback on my initial review  
9 of the standard. And, particularly, I'm going to  
10 focus on Appendix Alpha of the Reg Guide, Reg Guide  
11 1.247.

12 Go to the next slide.

13 This, this Reg Guide and as well as Reg  
14 Guide 1.200 is very important, and particularly  
15 Appendix Alpha. Those who haven't done a peer review  
16 for PRA, now the peer review team goes in to review  
17 the PRA, taking into account the standard  
18 requirements, as well as the exception, NRC exceptions  
19 and the wording in the appendix. All the front matter  
20 to the regulatory guide is really not reviewed during  
21 the peer review. It is, it is the requirements of the  
22 standard and the exceptions.

23 And, so, we measured the PRA attributes --  
24 which were, Hanh talked about those earlier with  
25 regard to the overall technical acceptability --

1 against those requirements and exceptions. And so,  
2 the exceptions become very important. There is as if  
3 they were written in the original peer review  
4 standard. We do not treat them any differently than  
5 whether the wording was written by the consensus  
6 group, the consensus standard and JCNRM, or whether  
7 the NRC took exception to it.

8 So, it's important that these words be  
9 carefully thought out. It's important that the NRC  
10 consider this and that the words follow the guidance  
11 of the original development of the standard. So,  
12 those exceptions really need to be in, all right,  
13 similar to the way we would have developed the  
14 standard.

15 Generally speaking, we have a couple of --  
16 we have some very key guidance in developing standards  
17 that come both from ANS and ASME. The main one I'm  
18 going to focus on is, I think Vesna mentioned it  
19 earlier, we do not describe any supporting  
20 requirements out to the requirements. We try to  
21 minimize "how to" guidance.

22 And, in fact, the NRC has for a long time  
23 tried to have us remove wording that were too much  
24 "how to," and get into the attributes and specify the  
25 attributes as in what makes a good PRA.

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1           And then the peer review team looks at  
2           what was performed and does it meet -- how the PRA was  
3           performed and does it meet the what of the standard.  
4           And so, we have worked very hard these last six years  
5           to remove all this "how to" guidance, as well as some  
6           other things. And that really needs to be considered  
7           in the development of the Reg Guide.

8           Let's go to the next slide.

9           I have just a few slides to provide some  
10          clarifications. Hanh went through some of this.  
11          Overall I would say that we disagree, I disagree with  
12          about half of the clarifications. The disagreement  
13          really come in the "how to," as well as some things of  
14          relatively inappropriate for the regulatory guide, and  
15          that you'll, you'll see here in a moment.

16          Some of them are simple. Like the first  
17          one, POS-A8 describes, has changed the pre-operational  
18          design phase PRA to require an operations review. We  
19          don't have operations personnel in the CP stage. We  
20          wrote the words very carefully to allow the design  
21          review during that phase. But NRC exception requires  
22          an operations person, even though we don't have  
23          operational personnel. And we would disagree with  
24          having that change.

25          POS-A10 redefines the plant operational

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1 state requiring plant operational state definitions to  
2 include changes in the barriers, propagation pathways,  
3 and modifications to fragilities.

4 Now, POSes are a defined term, "plant  
5 operational state." This comes from a lot of careful  
6 consideration with the consensus standard, so we would  
7 disagree on having the NRC redefine what a plant  
8 operational state is.

9 In addition, this is another example of  
10 just too much "how to" in the requirement, and it  
11 really should not be an exception, and those word  
12 changes should be changed.

13 Last example here, Hahn had noted that for  
14 low power shutdown the NRC changes has now required  
15 low power shutdown PRA to be performed at all stages  
16 of the licensing process. NRC is welcome to require  
17 this, but it doesn't belong in the standard.

18 The standard requires you to define what  
19 your -- whether you've done low power shutdown and  
20 what POSes you're covering in your PRA. And then peer  
21 review team will perform their peer review based on  
22 that scope. But the standard would never require low  
23 power shutdown, seismic analysis be done, or, you  
24 know, particularly the scope. It just says define it,  
25 and then have the peer review perform this review

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1       against that defined scope.

2               So, we believe that requiring low power  
3 shutdown in all stages really needs to go into another  
4 document other than the exceptions listed here.

5               Let's go to the next slide, just a couple  
6 more examples.

7               The NRC has added some words that got  
8 mentioned in Hahn's presentation, which I highlighted  
9 here in the human reliability analysis to include --  
10 and it's in multiple locations -- words such as "as  
11 well as the well-intended post-initiator operator  
12 responses to adverse impact." First, again, there's  
13 too much "how to." But what this really does is adds  
14 to the PRA the analysis of errors of commission.

15              Now, we have specifically not included  
16 errors of commission because the PRAs, PRAs performed  
17 today don't have a full evaluation of errors of  
18 commission. There are places where we do include it,  
19 such as spurious operation due to fire, which causes  
20 operator actions which may disable system. But an  
21 operator error of commission, a random error of  
22 commission, we don't have methodology by which we can  
23 do that. We don't have a document or a method to  
24 analyze that.

25              And this change is a large change in the

1 overall scope of the PRA, not supported by the  
2 consensus group. And we believe it's inappropriate  
3 for the Reg Guide to include the errors of commission.

4 In HRD-4 there's a reference to a NUREG  
5 0700. We removed all references and supporting  
6 requirements and high level requirements per NRC  
7 request, actually. And then to add back any reference  
8 to the supporting -- to a particular document. It  
9 needs to be removed. As a condolence I would note  
10 that this won't have a particular one because it ends  
11 up looking as if there's only one way to perform that  
12 particular analysis, and there is more than one  
13 reference guide on how to look at human factor  
14 guidelines. So, we would like that to be removed from  
15 the requirements.

16 There were a number of comments which we  
17 put off to the non-light water reactor standard, as  
18 Karl mentioned. One of them was to add to the number  
19 of locations to assess the feasibility of a human  
20 failure event, with a bunch of other words. And then  
21 if it's not feasible, to assign it a one point mode in  
22 the PRA. Now, of course it adds too much "how to."  
23 But the light water reactor standard looked at that.  
24 We've looked at it a number of times. We reject that  
25 change as too much "how to."

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1 Human reliability already -- analysis  
2 already does this. If the action isn't feasible, we  
3 don't credit the PRA. It's that simple. Don't need  
4 these words in the standard. It's too much "how to."  
5 We rejected this as a consensus body.

6 I'm not sure who in the NRC really wants  
7 to add these words in there, but they shouldn't be  
8 added in. It doesn't change how we do an HRA, and  
9 it's just not needed in the requirements.

10 And then another example, HRD-4 there's  
11 some words that are listed there. It's just way too  
12 many words and too much "how to" in the requirement.  
13 So, these added words don't really change what we do,  
14 and it just should be removed.

15 So, next slide.

16 Those are just some examples. I have a  
17 backup slide on the next page which provide a bunch of  
18 other examples of about half of the NRC exceptions.  
19 But we would take exception to the wording. There's  
20 too much "how to." We really need to go through the  
21 consensus process.

22 We, as Karl mentioned, we are open to  
23 feedback. We know the standard's not perfect. We  
24 generally accepted about 80 percent of the NRC  
25 comments in the past. The standard was approved in

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1 January, taking into account all the NRC comments at  
2 that time.

3 But since January, the NRC has found a  
4 whole bunch of new comments to make which are now  
5 included in Appendix Alpha. We would prefer those  
6 comments to come into the next revision which will be  
7 in another two or three years rather than come in  
8 without JCNRM review and consideration.

9 And so, if they really don't change what's  
10 done in the PRA, and they really don't affect things,  
11 we would prefer those to be removed from the Reg Guide  
12 and sent to the JCNRM for a normal comment process.

13 There are a number of things Hanh has  
14 mentioned that went to the light water reactor  
15 standard and were reviewed by light water reactor  
16 standard group. Those were, a number of those were  
17 accepted by the non-light water reactor group. And we  
18 have a final publication of that standard available  
19 right now in draft. And we hope to have it published  
20 by February of next year.

21 Those accepted changes in the light water  
22 reactor standard, those are fair game. And we  
23 appreciate that those should go into the Reg Guide so  
24 NRC can review that, and has till now. And so there  
25 were maybe a dozen-and-a-half changes in the light

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1 water reactor standard that are good changes to have  
2 in the Reg Guide. And so we, we take no exception to  
3 those at all.

4 Overall, as Hanh mentioned, there weren't  
5 any significant gaps in the current standard. A lot  
6 of them were just clarifications in the wording. And  
7 but so I don't see any issue with what the NRC has  
8 pointed out here. It's just the NRC needs to be a  
9 little bit more careful in writing the exceptions,  
10 taking into account the methods by which we develop  
11 standards, not doing too much "how to," and not adding  
12 things that have been rejected by either a consensus  
13 body in a comment review in the past.

14 That's all I have. If there are questions  
15 or comments, I'd appreciate it.

16 MEMBER PETTI: So, Dennis, Vicki has her  
17 hand up.

18 Go ahead, Vicki.

19 MEMBER BIER: Thanks. This is just a quick  
20 comment which is with regard to errors of commission.

21 The comment was made about it's  
22 inappropriate to expect people to analyze random  
23 errors of commission. And I just wanted to point out  
24 that I don't think anybody is expecting that people  
25 would analyze every possible error of commission. But

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1 even 20, 25 years ago there was already work on  
2 identifying which errors of commission were sort of  
3 likely or plausible.

4 And I haven't followed closely enough to  
5 know how that work has advanced and whether it's to a  
6 point that's reasonable to expect in a standard. But  
7 I just wanted to make that clarification.

8 MR. HENNEKE: Yeah. And let me say, a  
9 standard standardizes current practice, current best  
10 practice. So, we have a variation from PRA to PRA.  
11 And sometimes some PRAs don't match the best practice.

12 But if somebody's practicing it and we  
13 think it's good to include in the standard, we will  
14 improve the standard to account for best practice.

15 Currently there is no, there are no PRA  
16 methods by which to include errors of commissions.  
17 There are studies, and people have looked at it. But  
18 with regard to a systematic approach, we're including  
19 errors of commission only within those, again, caused  
20 by spurious operation that will result in operator  
21 actions to shutdown operating systems.

22 Other than that we just don't have an  
23 approach out there on what people are using in the  
24 PRAs. And so we shouldn't all of a sudden ratchet up  
25 the entire industry because some folks think, well, in

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1 the future we should look at errors of commission.

2 MEMBER BIER: Okay, thanks.

3 MEMBER PETTI: Karl, you had a comment?

4 MR. FLEMING: Yeah. I wanted to pick up on  
5 something that Dennis said about the -- on the plant  
6 operating state case about how it's, you know, sort of  
7 driven by the PRA applications.

8 I note that the Reg Guide doesn't seem to  
9 have any paraphrasing or coverage of Section 3 in the  
10 PRA standard, which is the PRA application process.  
11 But in Section 3 of the standard it clearly states  
12 that the user will select the scope and level of  
13 detail of his PRA to be consistent with the scope and  
14 level of detail of his design, as well as what his  
15 applications are.

16 So, that sort of gives in standard a lot  
17 of flexibility on how the standard could be used.

18 MEMBER PETTI: Okay. Given the time, are  
19 you done then, Dennis? We can move back to Donna for  
20 closing?

21 MR. HENNEKE: Yes. I am done. And like I  
22 said, there's one backup slide just for the NRC's  
23 clarification.

24 MEMBER PETTI: Donna, let's keep rolling.

25 MS. WILLIAMS: (Audio interference.)



1 MEMBER BROWN: She's breaking up, Dave.

2 MEMBER PETTI: Yeah, I'm having the same  
3 problem. It didn't know if it was my end or others.

4 Can people hear Donna?

5 MEMBER BROWN: No, haven't heard a word she  
6 said.

7 MEMBER PETTI: Donna, you're not coming  
8 through.

9 Can one of her colleagues let her know?

10 MS. WILLIAMS: Okay. Can you hear me now?

11 MEMBER PETTI: That's better. That's  
12 better.

13 MS. WILLIAMS: Okay. I think my headset  
14 wasn't working properly. I'll just shout into the  
15 computer.

16 All right. Yeah, just we're going to  
17 consider over the next couple of months is to have to  
18 consider the feedback for both ACRS and other  
19 stakeholders. Note that we have the full committee  
20 meeting in early October, as well as a public meeting  
21 on October 20th.

22 The next couple of months,  
23 October/November, we'll be going to internal review  
24 and concurrence here at the NRC, and issue for trial  
25 use in December. We expect that some near-term

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1 applicants will use it for trial use following that.

2 And then we note that the trial period is  
3 flexible. The length of it will depend on several  
4 factors such as the next version of the standard, all  
5 the rulemakings going on in the NRC, and feedback from  
6 early use.

7 And then, finally, as we noted earlier,  
8 this is as a trial use Reg Guide. There is no formal  
9 comment period. However, comments on all published  
10 Reg Guides, including this trial use Reg Guide, are  
11 encouraged at any time. And the NRC will consider  
12 comments and suggestions.

13 We note that the preliminary use was made  
14 public, so the stakeholders and public have an  
15 opportunity to review that.

16 We also note, we need to provide feedback  
17 on the preliminary use at the October 20th meeting, as  
18 well as they can send comments in via email to the  
19 technical contact listed in the Reg Guide.

20 Once the trial use Reg Guide is published  
21 in the Federal Register at the end of the year, it  
22 will include information how to submit comments,  
23 including through the federal rulemaking website  
24 regulations.gov.

25 And we also anticipate several public

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1 meetings and workshops after the trial use Reg Guide  
2 is published to solicit feedback from stakeholders.

3 So, this concludes the staff's  
4 presentation. We thank the subcommittee for the  
5 opportunity to brief you today, and we look forward to  
6 your feedback.

7 MEMBER PETTI: Okay, thank you.

8 Given the late hour, I'd like to go to  
9 public comments first. Do we have someone from NEI  
10 that wanted to make comment?

11 MS. ANDERSON: Yes. This is Victoria  
12 Anderson from NEI. Can you hear me?

13 MEMBER PETTI: Yes. Go ahead.

14 MS. ANDERSON: Excellent.

15 So, I wanted to just give a couple of  
16 remarks on behalf of NEI's members and other  
17 stakeholders.

18 We really appreciate the rapid staff  
19 action to endorse the ASME/ANS PRA standard, and the  
20 NEI 2009 peer review guidance. The endorsement of NEI  
21 2009 without exception is, in particular, very  
22 valuable to end users of these documents, and is the  
23 result of strong cooperation between NRC staff and  
24 industry.

25 After speaking with some of our members

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1 who have interest in the ANLWR space, we have some  
2 concerns about some of the staff clarifications on the  
3 ASME/ANS ANLWR PRA standard. In particular, we are  
4 very concerned about the addition of errors of  
5 commission in the staff's position. We do plan to  
6 discuss these concerns, including that concern, in  
7 detail when we meet with the staff during an October  
8 20th public meeting.

9 Finally, while this is not the focus of  
10 today's meeting, it was mentioned earlier that perhaps  
11 this regulatory guide and standard could be the one  
12 regulatory guide and standard for all PRAs for all  
13 reactor types. On behalf of NEI's members who  
14 currently operate reactors, I think we would need to  
15 look very carefully at the regulatory implications of  
16 that because of the extensive PRA development and peer  
17 review work that many operating reactors have already  
18 done.

19 So, we would need to make sure that the  
20 existing endorsements and existing regulatory guides  
21 were not sunset and were still available for licensee  
22 use.

23 That concludes my remarks. Thank you.

24 MEMBER PETTI: Thank you.

25 Any other public comment? If you are on

1 a phone line, it's Star-6, I believe.

2 (No response.)

3 MEMBER PETTI: Okay. I don't hear  
4 anything.

5 Colleagues, given we have 4 minutes left,  
6 the last item is whether or not to write a letter. I  
7 will just tell you that I have had emails, since  
8 Dennis is not with us, and Joy is not with us, both  
9 supporting a letter. Not that it would be long, but  
10 some of the issues that have come up more as sort of  
11 a punchlist to make sure that it's on the record and  
12 things aren't forgotten.

13 If there's anyone who thinks we shouldn't  
14 write a letter, why don't you speak now.

15 (No response.)

16 MEMBER PETTI: Okay. I'm not hearing  
17 anything. Then I will guess I will report back to  
18 Dennis that he's on the hook for a letter.

19 And I want to thank everyone. Very  
20 useful, very informative. And I've still got to fix  
21 my problem with not being able to see the slides.

22 For my colleagues who are having the same  
23 problem, I was googling on a Microsoft website. One  
24 of them said, You're just stuck. It's a bug and they  
25 haven't fixed it. So, go to a different computer was

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1 the most common response to fix it.

2 So, with that, I guess we will close this  
3 session. And I guess I'll see my colleagues back at  
4 two o'clock Eastern for our next subcommittee  
5 briefing.

6 Thank you all.

7 (Whereupon, at 12:58 p.m. EDT, the above-  
8 entitled matter was concluded.)  
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# **Trial Use RG 1.247 “Acceptability of Probabilistic Risk Assessment Results for Advanced Non-Light Water Reactor Risk-informed Activities”**

Briefing for the Advisory Committee on Reactors Safeguards  
Subcommittee on Future Plant Designs

Michelle Gonzalez, RES

Anders Gilbertson, RES

Hanh Phan, NRR

Martin Stutzke, NRR

Karl Fleming, JCNRM

Dennis Henneke, JCNRM

Donna Williams, NRR

September 20, 2021

# Presentation Outline

1. Background (Michelle Gonzalez)
2. Approach to Developing RG 1.247 (Anders Gilbertson)
3. Scope of the Endorsement RG and Staff Position Issues Addressed in RG (Hanh Phan/Martin Stutzke)
4. Future Activities/Revision of Non-LWR PRA Standard (Karl Fleming/Dennis Henneke)
5. Next Steps and Stakeholder Engagement (Donna Williams)



# **Background**

Michelle Gonzalez, RES

# Background

- The advanced non-light water reactor (ANLWR) PRA standard (ASME/ANS RA-S-1.4-2013) was issued in 2013 by ASME/ANS for trial use.
- In February 2021, ASME and ANS jointly issued ASME/ANS RA-S-1.4-2021, “Probabilistic Risk Assessment Standard for Advanced Non- Light Water Reactor Nuclear Power Plants”
  - The scope of the standard includes all levels of analysis (i.e. from initiating event to radiological consequence), all hazards and all operating modes (except internal fire PRA for LPSD-types of POSs).
  - The requirements in this standard cover PRAs performed during design, pre-operational, and post-operational phases.

# Background (cont'd)

- ACRS Subcommittee on Future Plant Designs-  
November 2, 2020
  - Staff discussed the updated endorsement plan and the ballot results
- Updates from last ACRS meeting
  - Draft white paper issued January 15, 2021 (ML21015A434)
  - Performance of PRA Peer Reviews Using the ASME/ANS Advanced Non-LWR PRA Standard issued May 5, 2021 (NEI 20-09)
  - Pre-decisional trial use RG made public September 7, 2021 (ML21246A216)

# **Draft White Paper: Demonstrating the Acceptability of PRA Results Used to Support Advanced Non-LWR Plant Licensing**

- Purpose: to provide staff views and perspectives on demonstrating acceptability of PRA results
- Provided early communication to stakeholders on issues to be addressed in RG 1.247
  - Public meeting held on February 23, 2021
  - Issues not addressed in RG 1.247 will be included in later documents

# **Endorsement of the Non-LWR PRA Standard and NEI 20-09**

- NLWR PRA Standard will be endorsed with a trial use RG
  - Trial use will allow for incorporation of lessons learned from early use and incorporation of ongoing regulatory efforts (10 CFR Part 53)
  - Comments accepted throughout the trial use period (Informal comment period)
  - Formal comment period to follow after the draft RG is issued
- Peer Review Guidance in NEI 20-09
  - Clean endorsement with no exceptions taken

# **Approach to Developing RG 1.247**

Anders Gilbertson, RES

# Topics

- RG 1.247 regulatory paradigm
- RG 1.247 development approach
- RG 1.247 v. RG 1.200 comparison
- Novel staff positions in RG 1.247

# RG 1.247 Regulatory Paradigm (1 of 2)

- RG 1.247 may be used to meet regulatory requirements related to the use of PRA
- The use of RG 1.247 helps *reduce* the need for an in-depth review of the PRA (RG 1.200 relates to *obviating* the need)
- RG 1.247 defines an application more broadly to accommodate design, pre-, and post-operational regulatory activities



# RG 1.247 Regulatory Paradigm (2 of 2)

- Guidance on NLWR PRA peer review considers that peer reviews are not required (consistent with DC/COL-ISG-028)
- However, RG 1.247 emphasizes the importance and utility of the peer review process and suggests that a pre-application peer review be performed
  - Promotes more efficient staff reviews of applications
- With the existing regulations, the staff have greater latitude to request information about an applicant's PRA

# RG 1.247 Development Approach (1 of 2)

- RG 1.200 is the starting point for RG 1.247
  - Organization and substance of content in RG 1.247 broadly mimics that of RG 1.200
- Staff positions in RG 1.247 consider the close relationships between the NLWR and LWR PRA standards
- Staff have considered the potential impact on future endorsements of LWR PRA standards

## **RG 1.247 Development Approach (2 of 2)**

- An information database tool was developed to help identify relationships and analyze differences between related requirements in different PRA standards and staff endorsements
- Applicability of current staff endorsement in RG 1.200 for related LWR PRA standard requirements were cross-checked against the NLWR PRA standard requirements

# RG 1.247 v. RG 1.200 Comparison (1 of 4)

## Some differences:

- RG 1.247 directly relates to meeting regulations
- RG 1.247 provides staff positions on the acceptability of PRA technical aspects for NLWRs that have not previously been provided for LWRs in RG 1.200
- RG 1.247 provides specific guidance on determining risk significance and the use of relative and absolute importance measures

# RG 1.247 v. RG 1.200 Comparison (2 of 4)

## Some differences:

- Consistent with the approach in the NLWR PRA standard, RG 1.247 does not use terms such as:
  - Level 1, Level 2, or Level 3 PRA
- RG 1.247 accommodates determining the acceptability of an NLWR PRA for an LMP application
- Because the staff identified no exceptions for NEI 20-09, the endorsement is only contained in the body of the RG
- Scope of RG 1.247 PRA elements not addressed in RG 1.200:
  - Plant Operating State Analysis for all POSs
  - Internal fire PRA for LPSD-types of POSs
  - Radiological consequence
  - Risk Integration

# RG 1.247 v. RG 1.200 Comparison (3 of 4)

## Some similarities:

- Most PRA elements addressed in RG 1.247 have an analog in RG 1.200, such as:
  - Initiating Event Analysis
  - Event Sequence Analysis
  - Success Criteria Development
  - Systems Analysis
  - Human Reliability Analysis
  - Data Analysis
  - Internal Flood PRA
  - Internal Fire PRA
  - Seismic PRA
  - Hazards Screening Analysis
  - High Wind PRA
  - External Flood PRA
  - Other Hazards PRA
  - Event Sequence Quantification
  - Mechanistic Source Term Analysis

# RG 1.247 v. RG 1.200 Comparison (4 of 4)

## Some similarities:

- Both include a table of hazards to consider in the development of a PRA
- Both provide guidance to applicants and licensees on:
  - What is an acceptable PRA (Section C.1)
  - The use of voluntary consensus standards and an acceptable peer review process (Section C.2)
  - How to demonstrate acceptability of PRA for an application (Section C.3)
  - PRA documentation needed to support a regulatory decision (Section C.4)

# Novel Staff Positions in RG 1.247 (1 of 5)

- Plant Operating State Analysis for all POSs
  - (Section C.1.3.1)
- Internal fire PRA for LPSD-types of POSs
  - (Section C.1.3.9)
- Radiological consequence
  - (Section C.1.3.17)
- Risk integration
  - (Section C.1.3.18)



# **Novel Staff Positions in RG 1.247 (2 of 5): Plant Operating States Analysis, all POSs**

- Staff position in RG 1.247 goes beyond the scope of RG 1.200 to address all POSs
- Considers that there may be more than one type of at-power POS (e.g., online refueling)
- Staff position accounts for the potential need for a similar staff position for LWRs

# **Novel Staff Positions in RG 1.247 (3 of 5): Internal Fire PRA, LPSD-Types of POSs**

- No analogous staff positions for LWRs
- The NLWR PRA standard does not provide related requirements; as such, acceptability is measured against the staff position in Section C.1.3.9 of RG 1.247
- Staff position accounts for the potential need for a similar staff position for LWRs
- NRC initiating a research project to develop guidance

# **Novel Staff Positions in RG 1.247 (4 of 5): Radiological Consequence**

- An LMP application evaluates frequency and radiological consequence risk
- Outside of LMP applications, there are no regulatory requirements to perform a PRA that assesses consequence risk
- However, it is still important to meet Commission expectations as expressed in various policy statements
- Risk surrogates used for NLWRs will need to be justified

# **Novel Staff Positions in RG 1.247 (5 of 5): Risk Integration**

- No staff position on risk integration has previously been promulgated
- Basis for staff position relates to meeting Commission expectations, as expressed in the Advanced Reactor Policy Statement, which in turn references the Safety Goal Policy Statement and the importance of meeting the QHOs
- Unless justified, relative risk significance criteria should be used to develop the PRA.
- Staff determination of PRA acceptability does not include consideration of risk reporting thresholds

# **Scope of RG 1.247 and Staff Positions on Non-LWR PRA Standard**

Hanh Phan, NRR

# RG 1.247 Guidance

RG 1.247 provides guidance, for trial use, in the following four areas:

1. Defining the acceptability of a PRA and its results used in support of an application – **RG 1.247, Section C.1**
2. Demonstrating the acceptability of the PRA and its results used in an application – **RG 1.247, Section C.3**
3. Documentation to support a regulatory decision – **RG 1.247, Section C.4**
4. Staff's positions on NLWR PRA standard and industry PRA peer review process – **RG 1.247, Section C.2 and Appendix A**

# Technical Reviewers

Technical Element	NRC Reviewer
Plant Operating States Analysis	Marie Pohida
Initiating Event Analysis	Keith Tetter
Event Sequence Analysis	Keith Tetter
Success Criteria Analysis	Keith Tetter
Systems Analysis	Hanh Phan
Human Reliability Analysis	Jonathan DeJesus
Data Analysis	Hanh Phan
Internal Flood PRA	Matt Humberstone
Internal Fire PRA	JS Hyslop
Internal Fire PRA LPSD	JS Hyslop
Seismic PRA	Shilp Vasavada
Hazard Screening Analysis	Alissa Neuhausen
High Winds PRA	John Lane
External Flooding PRA	Shilp Vasavada
Other Hazards PRA	Alissa Neuhausen
Event Sequence Quantification	Hanh Phan
Mechanistic Source Term Analysis	Michelle Hart
Radiological Consequence Analysis	Keith Compton
Risk Integration	Susan Cooper
Newly Developed Methods	Shilp Vasavada
Peer Review	Hanh Phan

# NLWR PRA Scope

- Address all radiological sources at the plant
  - Reactor cores
  - Spent fuel
  - Fuel reprocessing facilities
  - Accident scenarios that lead to a radioactive release from multiple radiological sources
- Address all hazards
  - All internal hazards such as, but not limited, to internal initiating events, internal floods, and internal fires
  - All external hazards such as, but not limited to, seismic events, external floods, and high wind events
- Address all plant operating states (e.g., at-power, low-power, shutdown)
- NLWR PRA should be a Level 3 PRA
  - Develop the frequencies of accident scenarios from the occurrence of an initiating event until the release of radioactive materials to the environment
  - Estimate the consequences that result from the release



# Applicable Regulations and Applications

- This RG applies to applications for NLWR licensing under 10 CFR Part 50
  - Current regulations do not require applicants for Part 50 construction permits or operating licenses to provide PRA-related information
  - Rulemaking “Incorporation of Lessons Learned from New Reactor Licensing Process (Parts 50 and 52 Licensing Process Alignment),” Docket NRC-2009-0196, RIN-3150-AI66
- This RG applies to applications for NLWR licensing under 10 CFR Part 52
  - Subpart B - Standard Design Certification (DC)
  - Subpart C - Combined License (COL)
  - Subpart E - Standard Design Approval (SDA)
  - Subpart F - Manufacturing License (ML)
- This RG is coordinated with 10 CFR Part 53 rulemaking effort
  - Rulemaking “Risk Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors,” Docket NRC-2019-0062, RIN 3150-AK31
  - Being developed as required by the Nuclear Energy Innovation and Modernization Act (NEIMA)

# Applicability of RG 1.247

Applies to only stationary NLWRs:

- Reactors that are constructed at a site
- Reactors that are constructed at an offsite facility and subsequently transported and installed at a site
- Does not address PRAs used to assess the risk of transporting NLWRs from an offsite facility to the site
- Does not address mobile reactors, which may be relocated to different sites after initial criticality

# Technical Elements

RG 1.247 endorses the following PRA standard technical elements:

- |                                   |                                       |
|-----------------------------------|---------------------------------------|
| 1. Plant Operating State Analysis | 10. Seismic PRA                       |
| 2. Initiating Event Analysis      | 11. Hazards Screening Analysis        |
| 3. Event Sequence Analysis        | 12. High Wind PRA                     |
| 4. Success Criteria Development   | 13. External Flooding                 |
| 5. Systems Analysis               | 14. Other Hazards PRA                 |
| 6. Human Reliability Analysis     | 15. Event Sequence Quantification     |
| 7. Data Analysis                  | 16. Mechanistic Source Term Analysis  |
| 8. Internal Flood PRA             | 17. Radiological Consequence Analysis |
| 9. Internal Fire PRA              | 18. Risk Integration                  |

... and ASME/ANS RA-S-1.4-2021:

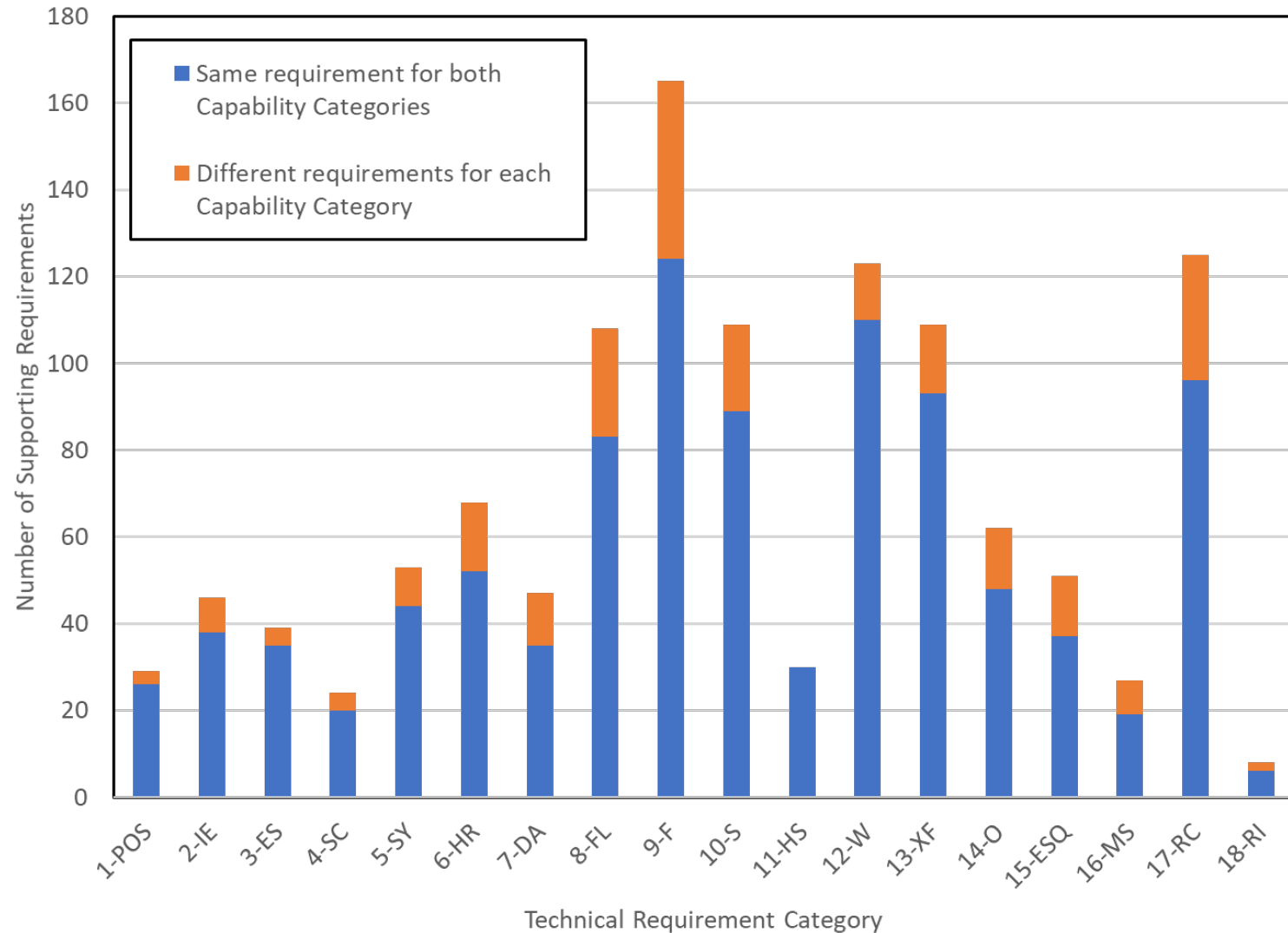
- Definitions and Risk Assessment Application
- PRA configuration control
- Peer review
- Newly Developed Methods

# Endorsement of Nonmandatory Appendices

- The nonmandatory appendices in ASME/ANS NLWR PRA standard may be binned into two groups:
  - a) Notes that support the understanding of various SRs, and
  - b) Commentaries
- The NRC staff generally accepts the “Notes”
- The NRC staff provides no opinion about the “Commentaries”

# Capability Categories

In general, about 20% of the supporting requirements distinguish between CC-I and CC-II



# **Section C.1 - Acceptability of a PRA and Its Results Used in Support of an Application**

- The staff assesses acceptability of the PRA and its results with respect to:
  - PRA scope
  - Level of detail
  - Conformance with consensus standard PRA elements
  - Plant representation of a PRA

# PRA Acceptability

## PRA Scope

- Metrics used to characterize risk
- Plant operating states (POSSs) for which the risk is to be evaluated
- Causes of initiating events (hazard groups)

## PRA Level of Detail

- Defined in terms of the resolution of the modeling used to represent the behavior and operations of the plant
- A minimal level of detail is necessary to ensure that the impacts of designed-in dependencies are correctly captured

## PRA Acceptability

## PRA Technical Elements

- Defined in terms of the fundamental technical analyses needed to develop and quantify the base PRA model for its intended purpose
- The characteristics and attributes of PRA technical elements define specific requirements that should be met

## Plant Representation

- How closely the base PRA represents the plant as it is actually built and operated
- The PRA should be maintained and upgraded, where necessary, to ensure it represents the as-built and as-operated plant

## **Section C.3 - Demonstrating Acceptability of PRA and Its Results Used in an Application**

For all applications, the PRA-related information provided in the submittal should:

- Describe the PRA's scope, level of detail, and degree of plant representation
- Demonstrate that the PRA has been developed and used in a technically acceptable manner, including the appropriateness of the assumptions and approximations
- Identify the application-specific acceptance criteria and demonstrate that they have been met



## **Section C.4 - Documentation to Support a Regulatory Decision**

- Documentation of the PRA model and the analyses performed should comprise both:
  - Archival information (i.e., available for audit or inspection), and
  - submittal information (i.e., submitted as part of the risk-informed request)
- Archival PRA documentation may be required on an as-needed basis to facilitate the NRC staff's review of the application

# Section C. 4 - Documentation (continued)

Archival PRA documentation should include:

- The process used to determine the acceptability of the PRA
- The methodology used to assess the risk of the application
- SSCs, operator actions, and plant operational characteristics affected by the application
- How the cause-effect relationships are mapped onto the PRA elements
- The PRA results that will be used to compare against the applicable acceptance criteria
- The scope of risk contributors (hazard groups and modes of operation) included in the PRA to support the application
- The results of the peer reviews of the PRA, PRA upgrades, and use of NDMs, and the results of F&O independent assessments, the resolution of all of the peer reviews
- The processes for maintaining & upgrading the PRA and the use of NDMs

## Section C.4 - Documentation (continued)

Submittal PRA documentation should include:

- Demonstration that the PRA model represents the as-designed, as-to-be-built, and as-to-be-operated plant or the as-built and as-operated plant
- The appropriateness of key assumptions and approximations and sensitivity studies
- The appropriateness of a given portion of the PRA that meets a capability category lower than deemed required for the application under consideration
- The appropriateness of PRA model upgrades, including the use of NDMs, for the application under consideration

# **Section C.2 and Appendix A - Staff Positions on PRA Standard and PRA Peer Review Process**

- About 80% of the requirements in the NLRW PRA standard were taken as-is from the set of LWR PRA standards
- First consideration ballot for the ANLWR PRA standard (3/24/20 – 5/26/20)
  - NRC staff submitted 489 comments, represented a broad set of staff views and perspectives
- Recirculation ballot for the ANLWR PRA standard (7/23/20 – 8/26/20)
  - NRC staff submitted 70 comments, included a mix of proposed technical changes and observations related to regulatory issues

# Section C.2 and Appendix A - Staff Position on PRA Standard (continued)

The staff position on each requirement in ASME/ANS RA-S-1.4-2021 is categorized as:

- **No objection** - The staff has no objection to the requirement
- **No objection with clarification** - The staff has no objection to the requirement. However, certain requirements, as written, are either unclear or ambiguous, and therefore the staff has provided its understanding of these requirements
- **No objection subject to the following qualification** - The staff has a technical concern with the requirement and has provided a qualification to resolve the concern

# Rationale for the Staff Positions

- JCNRM did not address during ballot process stating that comment needs to be addressed first in the LWR Level 1/LERF PRA standard
- Regulatory issue
- New issue
- Issue was not adequately addressed during balloting
- Not fully addressed by JCNRM
- Added for consistency with the staff's position in RG 1.200, Rev. 3

# Clarification and Qualification Positions

Table	Description	Clarification	Qualification	Total
A-1	Front Matter	3	2	5
A-2	Plant Operating States	3	5	8
A-3	Initiating Events	0	0	0
A-4	Event Sequences	0	0	0
A-5	Success Criteria	0	0	0
A-6	Systems Analysis	5	0	5
A-7	Human Reliability Analysis	7	4	11
A-8	Data Analysis	0	1	1
A-9	Internal Floods	7	1	8
A-10	Internal Fires	1	0	1
A-11	Seismic	22	6	28
A-12	Hazard Screening	8	1	9
A-13	High Winds	4	2	6
A-14	External Floods	14	1	15
A-15	Other Hazards	10	1	11
A-16	Quantification	0	0	0
A-17	Mechanistic Source Terms	0	0	0
A-18	Radiological Consequences	23	5	28
A-19	Risk Integration	6	2	8
A-20	Configuration Control	0	1	1
A-21	Peer Review	0	0	0
A-22	Newly Developed Methods	1	1	2
	<b>Totals</b>	<b>114</b>	<b>33</b>	<b>147</b>

# Substantive Clarifications and Qualifications

Group	Clarifications	Qualifications	Total
Group 1: Low Power and Shutdown Risk	2	2	4
Group 2: External Hazard Risk	4	2	6
Group 3: Errors of Commission	0	2	2
Group 4: Risk Significance	1	0	1
Group 5: Reporting Requirements	2	2	4
Total	9	8	17



# Group 1 - Low Power and Shutdown Risk

#	Index No.	Issue	Position	Resolution
1.1	POS-N-2	All stages of the licensing process should address low power and shutdown-types of evolutions	Clarification	<del>Early pre-operational stage PRAs are typically limited to at-power PRAs only.</del> All stages of the licensing process should address low power and shutdown-types of evolutions
1.2	POS-N-4	All stages of the licensing process should address low power and shutdown-types of evolutions	Clarification	<del>Depending on the application, the evolution to be addressed may range from at-power only to all plant operating states-outage types.</del> All stages of the licensing process should address low power and shutdown-types of evolutions.
1.3	POS-A1	Limiting the CC-I requirement for POS-A1 only to at-power plant evolutions potentially excludes a significant risk contributor as low-power and shutdown-types of POSs have been shown to have a comparable risk in some cases to at-power POSs. As such, the scope of the CC-I requirement should be the same as the scope of the CC-II requirement to avoid excluding potentially significant contributors to risk.	Qualification	<u>CC-I</u> <del>IDENTIFY a representative set of plant evolutions to be analyzed. INCLUDE, at a minimum, plant evolutions from at-power operations.</del> <del>See Note POS-N-1, POS-N-2, POS-N-3, POS-N-4</del> <u>CC-I and CC-II</u> IDENTIFY a representative set of plant evolutions to be analyzed, including refueling outages, other controlled shutdowns, and forced outages. See Note POS-N-3
1.4	POS-B1	Omitting the condition to ensure that the POS grouping does not impact risk-significant event sequences could significantly impact the results and insights from the PRA. As such, a new requirement is needed for CCI to reflect as much.	Qualification	<u>CC-I</u> GROUP plant evolutions into a set of representative evolutions. ENSURE that (a) the evolutions within a group can be considered similar in terms of the set of plant operating states that they contain; (b) the evolutions are bounded by the worst case impact within the group; (c) the grouping does not impact risk-significant event sequences.

## Group 2 - External Hazard Risk

#	Index No.	Issue	Position	Resolution
2.1	SFR-C1	Justification of the selected basis needs to be provided, especially for cases where the basis in an extension or expansion of available information. Note S-N-27 also mentions “plant-specific justification” which is not reflected in the SR.	Clarification	SPECIFY the basis for screening of inherently rugged components justifying the applicability to the plant and site or range of sites identified in SHA-A1.
2.2	SFR-C2	Justification of the selected basis needs to be provided, especially for cases where the basis in an extension or expansion of available information. This comment is also supported by the discussion in Note S-N-28.	Clarification	SPECIFY the basis and methodologies established for achieving the fragility thresholds defined in Requirement SPR-B5 justifying the applicability to the plant and site or range of sites identified in SHA-A1.
2.3	HS-A3	The requirement does not address plant-specific hazards, which may not be identified as part of the identification of site-specific or design-specific hazards or hazard groups. Additionally, note HS-N-5 appears to be applicable to HS-A3 as it directly relates to plant-specific hazards and hazard groups.	Clarification	IDENTIFY site-, plant-, or <del>and</del> design-specific <del>unique</del> hazards and hazard groups, as applicable to the stage of the plant lifecycle, not already identified in Requirement HS-A2.  See Notes HS-N3, HS-N-4, HS-N-5.
2.4	WHA-A5	150 mile distance is arbitrary	Clarification	...  a. meet SCR-3 in Table 1.10-1 by showing that the site <del>is more than 150 miles (approximately 250 km)</del> is sufficiently far away from the nearest tropical cyclone-prone coast to screen out tropical cyclone (hurricane or typhoon) high wind hazards from the probabilistic wind hazard analysis;

## Group 2 - External Hazard Risk (continued)

	Index No.	Issue	Position	Resolution
2.5	SHA-B5	SHA-B5 does not include consideration of (1) the use of an existing probabilistic SHA for a site and, (2) the impact of an updated catalog on the use of the existing probabilistic SHA. Given the likelihood of using an existing site as the bounding site (see SHA-A1), the considerations identified above are warranted.	Qualification	Add the following to SHA-B5:  If an existing probabilistic SHA is used, DEMONSTRATE that an updated catalog of earthquakes does not make the existing probabilistic SHA unviable.
2.6	HS-B5	The values in RI-A5 referenced in item (f) are presented as reporting values, not screening values. Using the reporting values as screening values could be too permissive in excluding contributors from the PRA as screening using a consequence criterion may not be effectively equivalent to screening using a frequency criterion. Additionally, this requirement is effectively for qualitative screening, as per SCR-3 in Table 1.10-1 and because item (f) is a quantitative criterion, it should therefore not be included in the list.	Qualification	USE SCR-3 in Table 1.10-1 when qualitatively screening out a hazard or hazard group by showing that either: (a) the hazard or hazard group cannot physically impact the plant or plant operations (e.g., it cannot occur close enough to the plant to affect it); (b) the hazard or hazard group does not result in a plant trip (manual or automatic) or require a plant shutdown; (c) the hazard or hazard group is included in the definition of another hazard; (d) the hazard or hazard group could not result in worse effects to the plant as another hazard that has a significantly higher frequency; (e) the hazard or hazard group is slow in developing and there is demonstrably sufficient time to eliminate the source of the threat or to provide an adequate response; <del>(f) the hazard or hazard group cannot produce a consequence above the value set in RI-A5.</del>

## Group 3 - Errors of Commission

#	Index No.	Issue	Position	Resolution
3.1	HLR-HR-E	The scope of high-level requirement (HLR) HR-E does not include errors of commission. See HR-E4 in this table for more details about the basis for this issue.	Qualification	A systematic review of relevant available procedures, any past operational events, procedural guidance, and training shall be used to identify the set of post-initiator operator responses required for each of the event sequences, as well as, the well-intended post-initiator operator responses that result in adverse safety impacts.
3.2	HR-E4	HR-E4 does not include errors of commission (EOC). EOCs should be included in the advanced non-light water reactor (LWR) PRA standard for the following reasons: (1) the significant amount of experience in operating LWRs facilitates a consensus between NRC and industry to exclude EOCs from the LWR Level 1/large, early release frequency (LERF) PRA standard; however, there is very little (if any) advanced non-LWR operating experience to allow the consensus to exclude EOCs from the advanced non-LWR PRA standard; (2) it is expected that advanced non-LWRs would rely less on human actions than LWRs, which implies that EOCs would play a more important role in advanced non-LWR PRAs than in LWR Level 1/LERF PRAs; and (3) given that (a) the scope of the advanced non-LWR PRA standard covers what in the LWR world is known as Level 2 PRA and (b) there is no consensus about EOCs in Level 2 PRA, the developers of PRAs for advanced non-LWRs should demonstrate that EOCs are not an issue before eliminating them from consideration.	Qualification	Add the following to item to HR-E4:  “(c) those well-intended actions performed by control room staff that disable a system, sub-system, or component needed in an event scenario.”

## Group 4 - Risk Significance

#	Index No.	Issue	Position	Resolution
4.1	RI-N-1	Proper use of relative and absolute risk significance criteria.	Clarification	<p>Add this text: The choice between using relative or absolute risk significance criteria to develop a PRA should consider issues such as, but not limited to the following:</p> <ul style="list-style-type: none"> <li>• The use of absolute risk significance criteria may yield a limited set of risk-significant items that is insufficient for developing risk insights or verifying the PRA model.</li> <li>• Importance measures traditionally used in LWR PRAs to identify relative risk significant items (e.g., FV and RAW) may be inaccurate or misleading when applied to noncoherent logic models (i.e., logic models that contain NOT logic).</li> <li>• A PRA that is developed using absolute risk significance criteria should be revised if relative risk significance criteria are used to support a subsequent application, and vice versa.</li> </ul> <p>The use of risk significance criteria (relative or absolute) should address the entire set of risk metrics computed by the PRA.</p>

## Group 5: Reporting Requirements

#	Index No.	Issue	Position	Resolution
5.1	RI-N-3	The staff do not consider reporting requirements when determining the acceptability of a PRA for a given application, such reporting requirements should be provided by the appropriate regulatory authority on an application-specific basis.	Clarification	The reporting requirement in RI-A4 does not need to be met to demonstrate PRA acceptability.
5.2	RI-N-4	The staff do not consider reporting requirements when determining the acceptability of a PRA for a given application. Such reporting requirements should be provided by the appropriate regulatory authority on an application-specific basis.	Clarification	The reporting requirement in RI-A5 does not need to be met to demonstrate PRA acceptability.
5.3	RI-A4	The staff do not consider reporting requirements when determining the acceptability of a PRA for a given application. Such reporting requirements should be provided by the appropriate regulatory authority on an application-specific basis.	Qualification	This requirement does not need to be met to demonstrate PRA acceptability.
5.4	RI-A5	The staff do not consider reporting requirements when determining the acceptability of a PRA for a given application. Such reporting requirements should be provided by the appropriate regulatory authority on an application-specific basis.	Qualification	This requirement does not need to be met to demonstrate PRA acceptability.

# **NEI 20-09**

## **PRA Peer Review Guidance**

- NRC staff received NEI 20-09, Rev. 0 on June 1, 2020
- Staff reviewed and provided observations during a public meeting on July 22, 2020
- Staff received a revision to NEI 20-09 on August 24, 2020
- Staff provided additional comments during a public meeting on October 26, 2020
- NEI submitted Revision 1 of NEI 20-09 on May 5, 2021

# NEI 20-09

## PRA Peer Review Guidance

- NEI 20-09, Rev. 1, is based on a related industry PRA peer review guidance document, NEI 17-07, Rev. 2, “Performance of PRA Peer Reviews Using the ASME/ANS PRA Standard,” as endorsed by RG 1.200, Rev. 3
- NEI 20-09 addresses all radiological sources, all hazards, all POSs, and all levels of PRA analysis
- NEI 20-09 process is applicable for a peer review performed for a PRA representing any stage of plant lifecycle
- The staff finds that the guidance in NEI 20-09, Rev. 1, is acceptable and thus endorses NEI 20-09, Rev. 1, without exception, in RG 1.247, Section C.2.2
- The ASME/ANS NLWR PRA standard contains requirements for the performance of an acceptable peer review process. The staff reviewed the requirements and takes no exceptions to them



# NEI 20-09 Pilots

- NEI plans to pilot the peer review process
- Staff to observe the pilots
- Observations will enhance the staff's positions in RG 1.247

# NLWR PRA Acceptability Issues (1 of 3)

- Ten issues were identified as a result of stakeholder feedback on the draft staff white paper “Demonstrating the Acceptability of Probabilistic Risk Assessment Results Used to Support Advanced Non-Light Water Reactor Plant Licensing:”
  - Draft staff white paper: ML21015A434 dated 1/19/2021
  - Public meeting held 2/23/2021
    - Staff presentation: ML21050A240
    - Industry presentation: ML21055A732
    - Meeting summary: ML21069A123 dated 3/17/2021
  - Public meeting held 3/30/2021
    - Staff presentation: ML21085A594
    - Meeting summary: ML21096A107 dated 4/15/2021
- Issue resolution status:
  - Addressed in RG 1.247, or
  - Being addressed in other staff guidance, or
  - Initiating research and developmental activities

# NLWR PRA Acceptability Issues (2 of 3)

No.	Issue	Resolution
1	Provide guidance on initial licensing that addresses all NLWRs (LMP or not LMP)	<p>LMP-based applications:</p> <ul style="list-style-type: none"> <li>• NEI 21-07 (industry TICAP guidance)</li> <li>• Trial use RG to endorse NEI 21-07</li> <li>• ARCAP roadmap ISG</li> <li>• ARCAP-related ISGs on specific topics</li> </ul> <p>Non-LMP-based Applications: deferred</p>
2	Provide guidance on graded PRA approaches	Working group formed to explore alternatives to PRA that achieve the same underlying purposes
3	Provide guidance on voluntary risk-informed applications (in addition to LMP) that may be part of an initial license application or after the license has been issued	NRR/RES work request
4	Address the use of risk surrogates	Addressed in RG 1.247
5	Address the use of seismic margins analysis (SMA)	<ul style="list-style-type: none"> <li>• SMA excluded in NLWR PRA standard and, hence, not addressed in RG 1.247</li> <li>• Applicants who seek to use SMA are encouraged to discuss during pre-application interactions</li> </ul>

# NLWR PRA Acceptability Issues (3 of 3)

No.	Issue	Resolution
6	Address completeness uncertainty	<ul style="list-style-type: none"> <li>• LPSD fires: NRR/RES work request</li> <li>• Uncertainty: NRR/RES work request</li> </ul>
7	Define the bounding site for external hazards and radiological consequence evaluation	Each applicant to propose and justify on a case-by-case basis
8	Address the applicability of supporting requirements (SRs) during various licensing stages	Develop ISG
9	Address the use of absolute and relative risk significance criteria	Addressed in RG 1.247
10	Use of peer reviews (full-scope and focused-scope) to demonstrate PRA acceptability	Addressed in RG 1.247

# Risk Significance (1 of 3)

- Goal: Identify what is important
- Uses:
  - Develop the PRA model
    - Increase level of detail and plant representation for risk significant items
    - Logic model debugging
    - Iterative process
  - Report PRA results
- Two approaches:
  - Relative risk significance
    - Normalized to total risk
    - Traditional PRA approach
  - Absolute risk significance
    - Normalized to a specified risk target (e.g., LMP frequency-consequence target curve, QHOs)
    - Concept evolved as a result of various LMP pilot exercises

# Risk Significance (2 of 3)

Risk Significant Basic Event	
Relative	A basic event that contributes significantly to baseline risk. It is defined as any basic event that has an Fussell-Vesely (FV) importance greater than 0.005 or a risk achievement worth (RAW) importance greater than 2 where the importance is normalized against the baseline total integrated risk or risk of a specific combination of source of radioactive material, hazard, and plant operating state.
Absolute	<p>A basic event that contributes significantly to an absolute risk significance criterion selected for RIDM. It is defined as any basic event that contributes significantly to an absolute risk significance criterion selected for RIDM. It is defined as any basic event that</p> <ul style="list-style-type: none"><li>a) contributes at least 1% to any identified absolute risk target; or</li><li>b) would result in exceeding the criterion if the basic event is assumed to fail with probability of 1.0.</li></ul>

# Risk Significance (3 of 3)

Risk Significant Event Sequence or Event Sequence Family	
Relative	An event sequence or event sequence family that, when rank-ordered by decreasing frequency, contributes a specified percentage of the baseline risk, or that individually contributes more than a specified percentage of the risk. For this version of the Standard, the aggregate percentage for the set is 95%, and the individual event sequence or event sequence family percentage is 1% of the total integrated risk or risk of a specific combination of source of radioactive material, hazard, and plant operating state.
Absolute	An event sequence or event sequence family included in a PRA model, defined at the functional or systematic level, that makes a significant contribution to an absolute risk target selected for RIDM. It is defined as any event sequence or event sequence family that contributes at least 1% to any identified absolute risk target.



# PERSONAL COMMENTS ON RG 1.247

Karl N. Fleming

Former Chair JCNRM WG on Advanced non-LWRs  
(Currently Vice Chair)

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## MY PERSONAL COMMENTS

The following comments are my personal opinions and do not reflect the official position of the JCNRM or supporting groups and subcommittees

# BACKGROUND

- Per NRC request JCNRM prioritized the schedule for this standard ahead of next edition LWR PRA standard
- JCNRM appreciates extensive involvement of NRC staff and NRC contractors in producing the standard and support of Ballot Reviews
- First consideration ballot in May 2020 yielded over 1300 comments including nearly 500 from NRC staff
- Second consideration ballot in July 2020 was unanimously approved by the JCNRM with 86 largely editorial comments mostly from the NRC
- Final editorial changes approved by JCNRM via two unanimous voice votes
- Standard approved by ASME and ANS boards, no comments in public review and final approval by ANSI
- Changes were made to the next edition of LWR standard recently balloted to minimize editorial inconsistencies.
- Given that background I was surprised that the approach taken to express clarifications in the RG was expressed in terms of so many further editorial changes rather than commentary regarding HOW the NRC staff expects the requirements to be addressed for regulatory applications.

# GENERAL COMMENTS

- There are several places that claim that “...risk characterization for NLWRs is typically expressed by cumulative risk metrics or risk surrogates”.
  - These statements should be modified to clarify that the fundamental metrics used to formulate the requirements characterize risk in terms of the **frequencies and radiological consequences of event sequence families (not individual sequences)**.
  - The NLWR standard does not use the LWR risk metrics CDF or LERF as explained in Section 1.9.1 so not clear why it is suggested as a possibility in the RG.
  - The PRA standard does not support the use of surrogate risk metrics as a means of expressing the results of the PRA but only as intermediate states for developing the event sequence model. If such intermediate metrics are used, the standard still expects that risk integration and evaluation of risk significance will be based on quantification of frequencies and consequences.
- Sections C.1.3 and C.1.4 provide a long discussion of objectives and attributes for each of the technical elements in the standard. These discussions overlap extensively with material in the standard that cover the same ground but they are not one for one and it would take a long time to figure out if there is anything different here. Rather than paraphrasing material on objectives and attributes already covered in the standard, the RG should focus on the specific items that the staff wishes to clarify
- Many of the clarifications in Appendix A refer to language shared with LWR supporting standards
- In the clarifications provided in Appendix A, it would be helpful for the staff to point out which changes are for alignment with LWR standard vs. those **unique to the NLWR standard**

# SPECIFIC COMMENTS

- Suggestion that “PRA technical adequacy” are the same as “PRA acceptability” needs clarification; “technical adequacy” is based on meeting requirements in an international consensus PRA standard while acceptability expresses a U.S. regulatory position.
- The PRA technical elements presented in Table 1 are not consistent with the ones used in the standard (See Table 1.4-1). The elements listed for internal events are applicable to all internal and external hazard groups. This is one of a number of examples where the RG is paraphrasing material in the standard but in a manner that is not always accurate.
- Should be clarified that the technical requirements for peer review are actually part of the standard and not separate entities as suggested in Figure 1 (Triangle Figure).
- Discussion on POS, MST, and other elements seem to lack appreciation of the need to address the impact of multiple reactors and sources.
- The RG treats documentation in one section whereas standard has documentation requirements specialized for each technical element
- Regarding the staff position on reporting requirements RI-A4(low frequency item) and RI-A5(low consequence item), which defer to specific applications, the authors of the standard believe these are fundamental to recognizing limitations in PRA technology.
- My colleague Dennis Henneke has additional general and specific comments to offer

# PLANS FOR NEXT REVISION

- Per JCNRM guidance, need to wait until all the supporting LWR standards are revised for consistency with the recently balloted LWR Level 1/LERF Standard
  - Low Power Shutdown Standard
  - Level 2 Standard
  - Level 3 Standard
  - Advanced LWR Standard
- Advanced non-LWR community needs to gain sufficient experience using the 2021 edition of the NLWR standard to identify the issues unique to NLWRs and to justify application of standard writing resources.
- Schedule for next revision is undefined

# Review of Draft RG 1.247 Appendix A – NRC Position on ASME/ANA RA-S-1.4-2021

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# Overview of ASME/ANS PRA Standard Requirements

- The Joint Committee on Nuclear Risk Management (JCNRM) develops and maintains PRA standards for LWRs and NLWRs using a consensus committee made up of all stakeholders including the NRC and its contractors.
  - The NRC provided hundreds of comments on RA-S-1.4-2021, the vast majority were accepted.
- PRA Standards for existing LWRs (draft 2021) and NLWRs (RA-S-1.4-2021) define the following to determine a technically acceptable PRA:
  - **Scope:** This includes the hazards (internal events, internal hazards and external hazards) and the plant operational states (full power, low power and shutdown) for each hazard.
  - **PRA Attributes:** as defined by the High Level Requirements (HLRs) and Supporting Requirements (SRs). HLRs are in the form of Shall statements and SRs support the HLRs. Content of HLRs and SRs are prescribed by the ASME and ANS guidance.
- The PRA standard SRs define what is required (performance-based) to meet the HLRs but should not describe “how to” meet the requirement or limit the approach to a single methodology by referencing a document in an SR.
  - The NRC and JCNRM members have provided numerous comments on removing wording from the SRs that were too much “how to” perform the PRAs.

# Feedback on NRC Clarifications

- The standard has undergone numerous rounds of review including in 2020, and the resulting standard is a consensus product. Many of the NRC clarifications have either gone through consensus review or should go through consensus review for determination of technical correctness:
  - POS-A8: the addition of requiring review of POSs identification by “operations personnel” prior to plant operations (in design) – when we will not necessarily have operations personnel.
  - POS-A10: The clarification requires POS definitions to include changes in “barriers,” “propagation pathways” and modification of fragilities” in the POS definitions.
    - This both disagrees with the definition of POS and is too much “how to” in the SR.
    - Changes such as this are addressed in the PRA modeling, not POS definition.
  - POS-A1 and Note POS-N-2: Clarification is requiring LPSP to be included at “All stages of the Licensing Process”.
    - Disagrees with the discussion throughout the standard and the consensus wording of POS-A1.
    - The standard is not a licensing document and should not discuss what is required at various stages of licensing.



# Feedback on NRC Clarifications

- HLR-HR-E; Added words to the HLR: A systematic review shall be used to identify post-initiator operator responses... *“as well as, the well-intended post-initiator operator responses that result in adverse safety impacts”*
  - Too much “how to” in the HLR.
  - When combined with changes to HR-E4 (*actions that disable a system...*); the changes now require additional analysis of errors of commission, not currently required by any PRA standard.
- HR-D4: Adds reference to NUREG-0700 for *“adherence to human factors guidelines”*
  - Again, too much “how to.”
  - Additionally, reference to a specific document in the SR is not appropriate, since this indicates only one acceptable approach to meet the SR.
- HR-G1: Adds to the requirement wording to *“ASSESS the feasibility of the HFE....; ASSIGN an HEP of 1.0...”* if not feasible.
  - Again, too much “how to.”
  - HRA techniques already include a feasibility step during the qualitative portion of the HRA.
  - A similar change was rejected by the JCNRM previously for the above reasons.
- HR-G4: Adds the wording: *“in supporting the decision, diagnosis, decision-making and action execution given the plant-specific and event scenario-specific context...communication among personnel in the same team and in different teams.”*
  - Again, too much “how to”

# Feedback on NRC Clarifications

- JCNRM standard are not perfect, and we welcome feedback and improvements through the consensus process.
  - Generally, we try to accommodate most comments through change in the standard wording.
  - Some of the NRC exceptions were changes incorporated into the LWR draft in publication (no objection to these).
  - RG 1.247 exceptions do not point to any significant gaps in the NLWR standard.
- The previous examples above are just a few examples where the draft RG should be improved (see backup slide for more examples):
  - Overall, these types of changes should be submitted to the JCNRM NLWR working group for review and consideration to ensure the standard SRs are correctly worded and supported by consensus review.
  - Any NRC recommended changes to the standard wording should be consistent with standard development guidance:
    - Wording should focus on what is required versus how to perform the PRA.
    - HLRs and SRs should not reference specific documents or limit the approach to one approach.
  - The standard should not dictate what scope is required at different phases of licensing.

# DWH Backup

- Other NRC clarifications which should be reviewed:
  - HR-G14 (to much “how to” shown in blue), HR-H2, DA-C20, FLEV-C1 (1<sup>st</sup> mention of temp. alignments – under documentation), SHA-B5, SHA-D3, SFR-C1, C2, SFR-D5 (no other mention of pathways), SFR-E3, E4, E5, E7 (wording is too limiting), HLR-SPR-B, SPR-B6 (expands the relay chatter from Risk-Significant SSCs to all SSCs), SPR-D6 (see previous feasibility comment), SPR-E8 (“and/or” not appropriate), HS-A3 (hazards are not “applicable” to a design stage), HS-B5 (change should be reviewed by JCNRM in brown), WFR-I1 (fix the bullet numbers), WPR-D11 (see previous feasibility comment), XFPR-E6, OPR-A4, OPR-C6 (feasibility), RCRE-A2, RCPA-A3, RCPA-A10, RCME-A2/4/7/8 (also refers to RG 1.23), RCME-A3, RCAD-A5, RCAD-B2, C1, RCDO-A and A1/6 (skin absorption not previously mentioned in the standard), RCDO-A8, RCQ-A3, RCQ-B3 (“results of interest” inaccurate).
- Notes not reviewed for this presentation.

# **Next Steps and Stakeholder Engagement**

Donna Williams, NRR

# Next Steps

- Consider feedback from ACRS/other stakeholders (September – mid-October)
- Public meeting October 20, 2021
- NRC concurrence and trial use RG publication - October – November
- Issue for trial use – December 2021
- Initial use by near-term applicants
- Trial use period is flexible, depending on timing of the next version of standard, rulemakings, and feedback from early use

# Comments and Feedback

- Comments and improvements on all published RGs including this trial use RG are encouraged at any time and the NRC will ensure consideration of such comments and suggestions.
- Preliminary trial use RG made public – September 7, 2021
- October 20, 2021- public meeting
- Trial Use RG published in FRN. FRN includes information on submitting comments.
- Public meetings/workshops to discuss feedback from first uses

# Acronyms

- ANLWR - advanced non-light water reactor
- ANS - American Nuclear Society
- ASME - American Society of Mechanical Engineers
- CFR – *Code of Federal Regulations*
- COL - combined license
- CP - construction permit
- DC - design certification
- ISG - interim staff guidance
- JCNRM - Joint Committee on Nuclear Risk Management
- LMP - licensing modernization project
- LPSD - low-power and shutdown
- LWR - light-water reactor
- NEI - Nuclear Energy Institute
- NRC - Nuclear Regulatory Commission
- NRR - Office of Nuclear Reactor Regulation
- OGC - Office of the General Counsel
- OL - operating license
- QHO – quantitative health objective
- POS – plant operating state
- PRA – probabilistic risk assessment
- RES - Office of Nuclear Regulatory Research
- RG - regulatory guide
- SC - subcommittee
- SSC – structures, systems and components
- SP - staff position
- SR - supporting requirement
- SSC - structure, system, and component

# General Framework for PRA Acceptability

