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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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FUTURE PLANT DESIGNS SUBCOMMITTEE

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MONDAY

SEPTEMBER 20, 2021

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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.

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

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

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

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

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

I would have expected the new reg guide to

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Mr. Fard?

MR. REISI-FARD: Good morning, was someone

saying something?

MEMBER BLEY: No, go ahead.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

As such, the Staff will keep decision-makers appraised of any actionable feedback or potential changes the Staff may implement in response to such feedback.

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

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

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

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

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

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

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

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

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

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

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

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

MEMBER BLEY: That's addressed to the Staff?

MEMBER BROWN: Yes, that's addressed to

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

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

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

MEMBER BROWN: That's fine.

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

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

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

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

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

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

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

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

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

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

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

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

Hanh Phan and Marty Stutzke, both from

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

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

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

Next slide, please, Donna.

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

MS. GONZALEZ: Slide 4.

MEMBER BLEY: Thank you.

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

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

to the JCNRM at that point.

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

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

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

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

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

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

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

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

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

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

MEMBER BROWN: Thank you, Dennis.

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

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

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

the design, pre-operational, and operational phases.

Slide 5, please.

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

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

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

MEMBER BALLINGER: I got that, Charlie.

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

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

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

I will go into more details on the paper

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

MEMBER BLEY: Before you go, Michelle, on

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

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

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

MS. GONZALEZ: Not exactly.

MEMBER BLEY: Thank you.

MS. GONZALEZ: You're welcome.

MR. PHAN: Anders?

MR. GILBERTSON: Yes?

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

So, with that, please move to Slide 10.

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

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

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

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

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

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

However, up until that point, the Reg

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

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

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

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

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

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

So, as you're asking about, the initiative

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

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

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

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

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

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

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

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

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

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

So, we think we're comprehensive.

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

MR. STUTZKE: Yes.

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

MR. STUTZKE: Yes.

MEMBER REMPE: Thank you.

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

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

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

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

MEMBER BLEY: I certainly agree with you.

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

We recognize that because of it's

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

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

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

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

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

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

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

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

MEMBER BLEY: Thanks very much, go ahead.

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

What does that imply?

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

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

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

certification.

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

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

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

Does that help address your question?

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

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

MR. GILBERTSON: Are you're saying they

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

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

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

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

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

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

in-depth review.

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

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

But the licensee is not submitting the entire PRA.

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

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

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

MR. GILBERTSON: I think another bullet or

two later on might help to clarify that.

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

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

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

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

MEMBER BIER: Thank you.

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

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

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

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

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

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

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

So, while it remains true there are no

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

So, that's what motivated that peer review.

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

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

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

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

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

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

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

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

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

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

Reg Guide 1.247.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

development.

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

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

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

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

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

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

It may have to do with the technology or

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

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

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

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

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

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

But really, it was intended to just ensure

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

And while the non-LWR PRA standard does

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

MEMBER BLEY: Okay, thanks, Marty.

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

bit.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Slide 21, please.

Again, the Staff position on consequence

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

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

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

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

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

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

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

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

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

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

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

MR. GILBERTSON: You know what? To answer

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

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

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

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

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

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

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

what you're referring to?

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

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

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

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

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

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

DR. COMPTON: I will take that question

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

MEMBER REMPE: Absolutely, thank you.

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

How many more slides do you have?

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

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

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

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

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

have to check those kinds of things?

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

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

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

MR. GILBERTSON: Right.

MEMBER BIER: Got it, thank you.

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

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

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

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

resumed at 11:19 a.m.)

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

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

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

Hanh, are you ready?

MR. PHAN: Yes, sir.

MEMBER BLEY: Please, good.

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

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

24, please.

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

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

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

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

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

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

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

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

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

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

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

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

may be relocated to multiple sites after the initial recalibrating.

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

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

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

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

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

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

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

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

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

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

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

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

MEMBER DIMITRIJEVIC: I have a question on

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

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

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

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

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

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

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

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

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

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

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

Section C4, the next slide, please, 35.

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

information, submit it in the application.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

MEMBER BLEY: Hanh?

MR. PHAN: Yes, sir?

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Next please, Slide 49.

MEMBER BLEY: Hanh?

MR. PHAN: Yes?

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

you that you change that language.

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

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

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

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

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

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

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

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

MR. PHAN: Thank you for your advice.

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

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

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

MR. PHAN: Please do.

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

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

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

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

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

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

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

MR. PHAN: Please go to Slide 48, thank

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

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

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

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

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

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

requirements for the performance of acceptable peer review process.

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

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

Please take over, Marty.

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

MR. STUTZKE: Ten minutes.

MEMBER BLEY: Go ahead.

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

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

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

then there would be application-specific regulatory guidance.

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

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

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

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

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

non-LWRs.

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

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

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

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

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

MEMBER BLEY: Marty?

MR. STUTZKE: Yes?

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

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

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

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

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

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

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

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

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

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

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

MEMBER BLEY: Thanks.

MR. STUTZKE: It's an enormous problem.

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

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

shutdown fire PRA.

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

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

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

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

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

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

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

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

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

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

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

A couple of points I would make about peer reviews.

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

to maintain their proprietary information proprietary.

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

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

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

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

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

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

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

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

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

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

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

So, this is basic events risk significance

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

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

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

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

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

With that, I believe I'm done.

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

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

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

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

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

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

Karl, please go ahead.

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

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

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

not reflect any official position of JCNRM.

Next slide, please.

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

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

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

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

the standard, which has been unanimously approved.

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

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

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

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

MEMBER BLEY: Karl.

MR. FLEMING: Yes?

MEMBER BLEY: If I could. When I heard

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

MR. FLEMING: Yes.

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

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

Go ahead.

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

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

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

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

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

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

MEMBER BLEY: Karl.

MR. FLEMING: Yes.

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

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

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

MR. FLEMING: Right.

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

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

But go ahead. Thanks, Karl.

MR. FLEMING: Yeah, thanks.

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

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

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

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

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

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

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

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

You know, I just wanted to make a comment.

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

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

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

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

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

standard.

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

In the paraphrasing --

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

MR. FLEMING: Please, yes.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

MEMBER BLEY: Karl.

MR. FLEMING: Yeah. Yes?

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

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

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

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

concerns like that that arose.

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

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

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

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

standard a couple years ago.

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

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

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

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

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

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

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

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

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

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

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

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

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

MEMBER PETTI: Okay, thanks.

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

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

shot.

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

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

Go to the next slide.

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

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

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

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

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

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

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

Let's go to the next slide.

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

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

POS-A10 redefines the plant operational

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

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

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

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

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

against that defined scope.

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

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

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

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

And this change is a large change in the

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

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

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

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

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

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

So, next slide.

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

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

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

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

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

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

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

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

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

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

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

Go ahead, Vicki.

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

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

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

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

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

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

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

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

the future we should look at errors of commission.

MEMBER BIER: Okay, thanks.

MEMBER PETTI: Karl, you had a comment?

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

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

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

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

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

MEMBER PETTI: Donna, let's keep rolling.

MS. WILLIAMS: (Audio interference.)

MEMBER BROWN: She's breaking up, Dave.

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

Can people hear Donna?

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

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

Can one of her colleagues let her know?

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

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

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

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

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

applicants will use it for trial use following that.

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

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

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

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

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

And we also anticipate several public

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

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

MEMBER PETTI: Okay, thank you.

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

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

MEMBER PETTI: Yes. Go ahead.

MS. ANDERSON: Excellent.

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

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

After speaking with some of our members

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

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

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

That concludes my remarks. Thank you.

MEMBER PETTI: Thank you.

Any other public comment? If you are on

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

(No response.)

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

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

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

(No response.)

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

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

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

the most common response to fix it.

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

Thank you all.

(Whereupon, at 12:58 p.m. EDT, the above-entitled matter was concluded.)

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

… and ASME/ANS RA-S-1.4-2021:

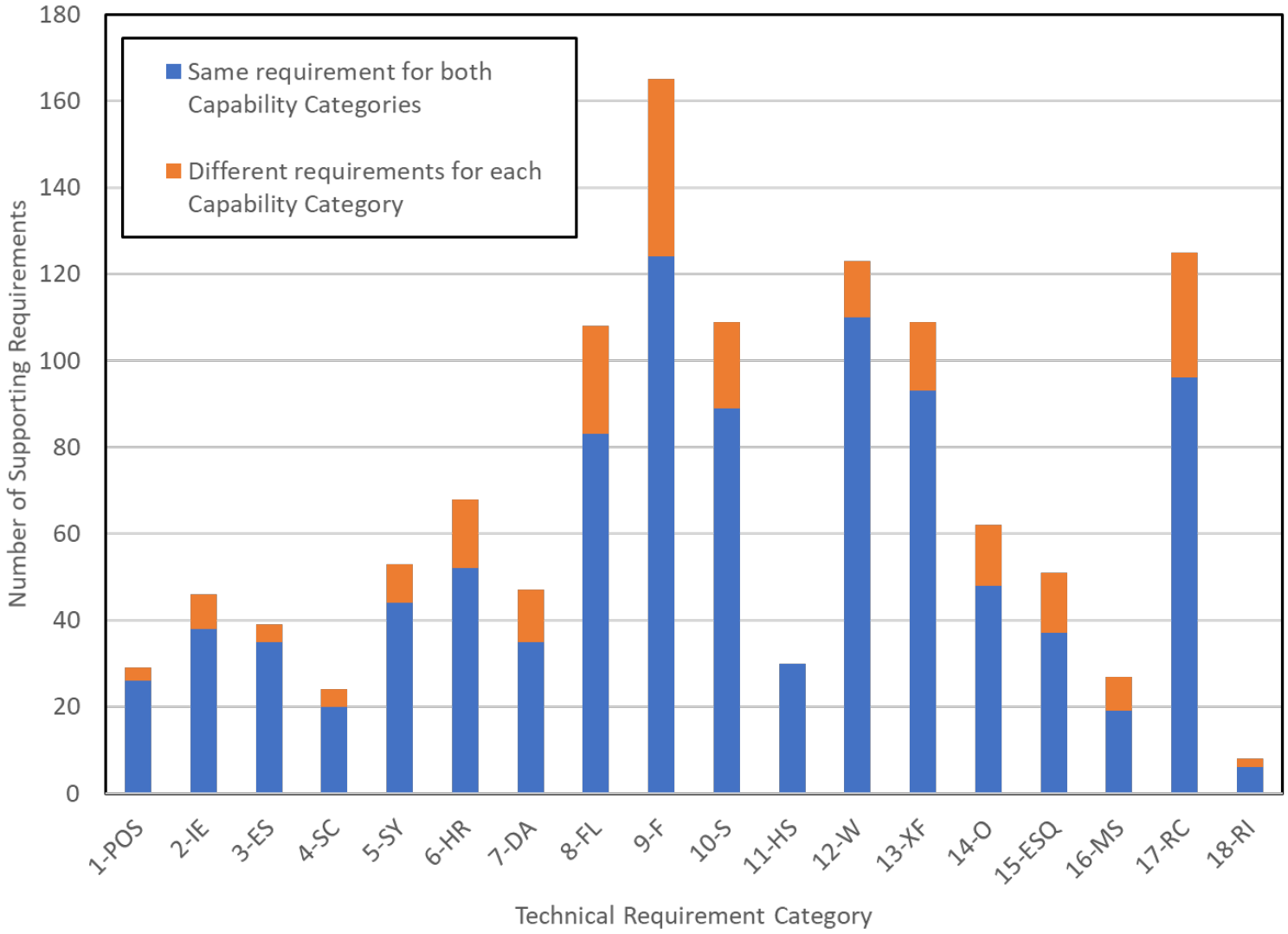
- Definitions and Risk Assessment Application
- PRA configuration control
- Peer review
- Newly Developed Methods

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 (POSs) 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
	Totals	**114**	**33**	**147**

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	~~Early pre-operational stage PRAs are typically limited to at-power PRAs only.~~ 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	~~Depending on the application, the evolution to be addressed may range from at-power only to all plant operating states outage types.~~ 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	CC-I ~~IDENTIFY a representative set of plant evolutions to be analyzed. INCLUDE, at a minimum, plant evolutions from at-power operations.~~ ~~See Note POS-N-1, POS-N-2, POS-N-3, POS-N-4~~ CC-I and CC-II 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	CC-I 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 ~~and~~ design-specific ~~unique~~ 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 ~~is more than 150 miles (approximately 250 km)~~ 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; ~~(f) the hazard or hazard group cannot produce a consequence above the value set in RI-A5.~~

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	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: • 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. • 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). • 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. The use of risk significance criteria (relative or absolute) should address the entire set of risk metrics computed by the PRA.

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)	LMP-based applications: • NEI 21-07 (industry TICAP guidance) • Trial use RG to endorse NEI 21-07 • ARCAP roadmap ISG • ARCAP-related ISGs on specific topics Non-LMP-based Applications: deferred
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)	• SMA excluded in NLWR PRA standard and, hence, not addressed in RG 1.247 • Applicants who seek to use SMA are encouraged to discuss during pre-application interactions

NLWR PRA Acceptability Issues (3 of 3)

No.	Issue	Resolution
6	Address completeness uncertainty	• LPSD fires: NRR/RES work request • Uncertainty: NRR/RES work request
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	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 a) contributes at least 1% to any identified absolute risk target; or b) would result in exceeding the criterion if the basic event is assumed to fail with probability of 1.0.

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 the that 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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* Not representing ANS or the JCNRM for this presentation.

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 LPSD 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 (1st 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