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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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THURSDAY

DECEMBER 16, 2021

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The Subcommittee met via Teleconference, at 9:30 a.m. EST, David Petti, Chair, presiding.

COMMITTEE MEMBERS:

DAVID A. PETTI, Chair

RONALD G. BALLINGER, Member

VICKI M. BIER, Member

DENNIS BLEY, Member

CHARLES H. BROWN, JR. Member

VESNA B. DIMITRIJEVIC, Member

GREGORY H. HALNON, Member

WALTER L. KIRCHNER, Member

JOY L. REMPE, Member

MATTHEW W. SUNSERI, Member

DESIGNATED FEDERAL OFFICIAL:

DEREK WIDMAYER

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

9:30 a.m.

CHAIR PETTI: 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 David Petti, Chairman of the Subcommittee.

ACRS members in attendance are Vicki Bier, Charlie Brown, Consultant Dennis Bley, Greg Halnon, Joy Rempe, Ron Ballinger, Matt Sunseri, Vesna Dimitrijevic --

MEMBER BLEY: Hey, Dave?

CHAIR PETTI: Yes?

MEMBER BLEY: I'm still a member until the end of --

CHAIR PETTI: Oh, okay, great. Member Bley. Great.

Derek Widmayer of the ACRS staff is the Designated Federal Official for this meeting.

The purpose of this two-day meeting is to discuss four subjects concerning preliminary rule language for 10 CFR Part 53, Licensing and Regulation of Advanced Nuclear Reactors.

The agenda for today includes discussions on Subpart F, Requirements for Operations;

specifically, language on staffing, training, personnel, and human factors; Subpart C, Requirements for Design and Analysis; specifically, language related to probabilistic risk assessments.

Tomorrow, the meeting will include discussions on the technology-inclusive content of application TICAP and the advanced reactor content of application ARCAP documents, and presentation from representatives of the Nuclear Energy Institute and the U.S. Nuclear Industry Council on a comprehensive set of comments submitted on the Part 53 rulemaking. The Subcommittee will gather information, analysis all the issues and facts, and formulate proposed positions and actions, as appropriate.

This meeting is one in a series of Subcommittee meetings being held to discuss Part 53. There's a session scheduled for the February 2022 full Committee meeting, at which the Subpart F requirements for operations will be presented and discussed, and the Committee plans on preparing a letter report on this matter at that meeting.

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 through its published letter reports. We hold meetings to gather information and to form 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 13th, 2019.

The ACRS section of the U.S. NRC public website provides our Charter, Bylaws, agendas, letter reports, and full transcripts of all full and subcommittee meetings, including slides presented at the 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 and tomorrow's meeting is open to public attendance, and we have received no requests to make an oral statement at the meeting. Time is provided in the agenda after presentations are completed for this statement, as well as spontaneous

comments from our other members of the public attending or listening to our meetings.

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

A transcript of today's meeting is being kept. Therefore, we request that meeting participants on Teams and the bridgeline identify themselves when they speak and to speak with sufficient clarity and volume, so they can be readily heard. Likewise, we request that meeting participants keep their computer and their telephone lines on mute when not speaking to minimize disruptions.

At this time, I ask that team attendees make sure they're unmuted so we can commence the meeting.

We'll now proceed, and I call on Steve Lynch, Acting Branch Chief for the Advanced Reactor Policy Branch of the Office of Nuclear Reactor Regulation, for any opening remarks.

Steve?

MR. LYNCH: Great. Thank you so much.

Again, this is Steve Lynch, Acting Chief of the Advanced Reactor Policy Branch.

I really just want to thank the ACRS members for meeting with the staff today to support us in the continued development and iteration on the preliminary proposed rule language for Part 53. It is really valuable for us to get insights from the members, so that we can ensure that we have a rulemaking that is most responsive to industry needs, as advanced reactors continue to be developed and applications prepared and submitted to the NRC.

The topics today that we will be covering are more technical in nature than tomorrow's topics. In particular, as we go over the role of PRA with Marty Stutzke, one of the things that we want to cover with the ACRS is going beyond PRA. And for applicants that wish to use a graded PRA or more deterministic approach to analyze potential events at a facility, how can they do that within the Part 53 framework, and how has the NRC staff considered providing these alternatives, either within Part 53 or in Part 50, or even in another new part to the regulation, so that we are making sure that we are given a full range of options in performing analyses for advanced reactor events?

And then, we do want to also, in the afternoon, focus more on the differences in operation

of advanced reactors from the current operating fleet of large light water reactors, and how that impacts potential considerations for operators at these facilities. Bill Reckley will be leading this discussion with support from Jesse Seymour and Jordan Hoellman.

Tomorrow, we will focus more on one of the most integral guidance documents that are being developed to support advanced reactor application development and implementation of Part 53. And that's with the TICAP and ARCAP guidance.

Then, our focus tomorrow morning on these guidance document developments will be on major revisions that have occurred since the NRC staff last met with the ACRS on this topic in July of this year. And we have Joe Sebrosky and Eric Oesterle leading these discussions.

So, again, we thank the ACRS members for their time today and tomorrow and look forward to your feedback. Thank you.

CHAIR PETTI: Okay. Marty?

MR. BEALL: Actually, Dave, this is Bob Beall. I'm going to do a quick update of the Part 53 schedule.

CHAIR PETTI: Oh, I knew that, yes. Yes,

sorry, go ahead.

MR. BEALL: Okay. Thank you, sir.

Good morning. My name is Bob Beall, and I'm from the NRC's Office of Nuclear Material Safety and Safeguards. I'm the Project Manager for the Part 53 rulemaking. I will be providing a status update of the Part 53 rulemaking and an overview of the recent changes to the rulemaking schedule.

This is the Part 53 framework slide that the staff has used in many of our past meetings with this Committee. It lays out our structure and philosophy behind the Part 53 rulemaking and provides a short overview of each of the Subparts A through J and, also, conforming changes to other 10 CFR parts, like Part 73 and 26.

Today, the staff will be discussing the highlighted topics from Subpart C, Design Analysis Requirements as It Pertains to the Use of PRA, and Subpart F, Requirements for Operations, with an overview of the subpart and a more detailed discussion on staffing, operator certifications, and the use of simulators.

Next slide, please.

This slide provides a snapshot of the preliminary proposed rule language for the Part 53

rulemaking. By the end of 2021, all the major Part 53 subparts are scheduled to be issued for public comment. This includes the release of preliminary proposed rule language for Parts 73 and 26. A number of these subparts are on their second or third iteration of the preliminary proposed rule language, and the staff will continue to release additional iterations into 2022.

The two highlighted rules are related to today's discussion. All of these documents are available in ADAMS and on the regulations.gov website.

Next slide, please.

In late November, the Commission approved a nine-month extension of the Part 53 rulemaking schedule. The revised rulemaking schedule provides additional time for the staff to continue our efforts to reach alignment with external stakeholders on the scope of the rulemaking and to further develop the proposed Part 53 rule language. It will also allow additional time for stakeholders and the ACRS to participate in the Part 53 rulemaking process, and to continue coordination with other NRC advanced reactor activities and rulemakings.

The revised rulemaking schedule has the staff continuing public outreach activities and the

release of preliminary proposed rule language into August of 2022. During this timeframe, we will also have a public meeting that is oriented towards non-governmental organizations in early February.

The staff is scheduled to submit the draft proposed rule to the Commission in February of 2023 with a projected publication of the Part 53 proposed rule for public comment in June of the same year.

During the generation of the Draft Final Rule, the staff will continue our public outreach activities until May of 2024, which supports submitting the Draft Part 53 Final Rule to the Commission by December of 2024. The current scheduled publication date for the Final Part 53 Rule is now July 2025.

Next slide, please.

The staff activities related to Part 53 public outreach will continue into 2022. Some of the key points will be the continuation of topical public meetings and frequent meetings with this ACRS Subcommittee. This includes meetings on Part 53 subparts that ACRS members want additional staff input on.

The staff is also planning to continue to publicly release preliminary proposed rule text into

2022. This staff will also move away from releasing the preliminary proposed rule language from a discussion table format to having a consolidated Part 53 rule language document. The staff is projecting to have this document available for public comment in January of 2022.

Next slide, please.

The Part 53 staff has been and will continue to coordinate with other advanced reactor activities and rulemakings. For example, four rulemakings that the staff is closely monitoring and communicating with are the emergency preparedness for small modular reactors and other new technologies; physical security for advanced reactors; regulatory improvements for production and utilization facilities transitioning to decommissioning, and the alignment of licensing processes and lessons learned from new reactor licensing.

Each of these rules has proposed requirements that may influence the rule language in Part 53. In the case of the Part 50.52 lessons learned rule, there are approximately seven issues, ranging from severe accidents to environmental assessments, that may require revisions in the future to the proposed Part 53 requirements. The staff will

continue to monitor these activities and communicate with the appropriate staff during development of the Part 53 rule.

MEMBER REMPE: So, this is Joy, and I guess if you're done with this slide --

MR. BEALL: Yes, ma'am.

MEMBER REMPE: -- I just wanted to bring up, again, repeat a concern that's often been raised by members.

I've been starting to prepare for our discussions on the Part 50.52 alignment and lessons learned activity. And I still am a little concerned about the coordination, not just of the rule languages, or the language in both rules, or proposed rules, but also the guidance document and how that coordination will occur. And just to be clear, it's still possible for a non-LWR or an advanced small modular LWR to go with either option in the future here. A non-LWR can go with 50.52. The lines are very fuzzy.

The staff's intent is to have a particular guidance document that's applicable to both 53 and 50.52 alignment activities. And I'm having trouble seeing how you're going to keep things coordinated and deal with all the updates, as the texts are issued.

And at some point, maybe either under a Part 53 discussion or a Part 50.52 discussion, it might be worthwhile to go through some examples, to just give me and other members a bit more confidence that this coordination is happening as anticipated. I mean, it just seems very convoluted to me.

MR. BEALL: Okay, we can do that in a future ACRS meeting.

But, also, just for your information, there are a number of staff that work on both of the rulemakings, or, in fact, for at least four in here, there's a lot of shared responsibilities that the Working Group members would have in both Part 53 and one or more of these other four that you see on this slide here. So, there is a lot of communications between each of the rulemakings. And my counterparts, too, with the person who's running the Part 50.52 lessons learned rule, we communicate also on a regular basis. So, there is a lot of crosstalk and a lot of coordination between each of the Working Groups and the rulemaking PMs.

MEMBER REMPE: So, I've heard that before, too. Maybe just going through one example that was very difficult and how staff quickly reacted to a change, either in 50.52 that affected 53, or vice

versa, it would just add some confidence in future discussions. And I'm bringing it up here just because of some discussions I had a couple of weeks ago. It would just help, one place or the other, to have that discussion occur.

MR. BEALL: Okay, we can take that as a takeaway, Joy.

MEMBER REMPE: Thank you.

MR. BEALL: No problem.

MEMBER KIRCHNER: Joy, this is Walt.

MEMBER REMPE: Yes?

MEMBER KIRCHNER: May I make a comment?

Yes, my concern would be that, as the Agency goes ahead with 53, that it demonstrably provides a level of assurance to the public with regard to safety. And that gets into issues that we've talked through before with the staff, things like how the GDCs and quality assurance requirements that are applicable 50.52 are matched in kind in some way in 53, such that there's an assurance that there's an equivalent level of safety achieved.

And that would apply to not just GDCs or the advanced reactor design criteria and quality assurance, but other things that we'll hear about today, such as operator requirements, et cetera. So

that, as these packages come together, I wouldn't expect them to be seamlessly compatible, but, certainly, at some level, there has to be demonstrably an equivalent level of safety assurance provided to the public for 53 vis-a-vis 50.52.

That's more of a statement. And as you say, some examples perhaps would certainly try to flesh out these kinds of matters in --

MEMBER REMPE: Yes.

MEMBER KIRCHNER: -- checking out how that alignment and the guidance is consistent across the 50.52-53 spectrum.

MEMBER REMPE: I agree. Just what I was thinking about after the discussion I had to prepare for the 50.52 meeting, I was just thinking, you know, I've heard this a lot. I've heard that the same staff is working on it. But I just, you know, keep seeing areas of interaction that I just think some examples that were difficult would help us. I mean, not easy examples, but some things that were difficult, and how the staff recognized it and addressed it, would give us all a little more confidence.

And we have raised these issues in the past, and we've heard the same answers. But we all are still struggling with it when we look at what's

coming down the pike.

Anyway, I think we've got the point across. And so, hopefully, we can see those examples and we can deal with it, or learn about it.

MEMBER BALLINGER: This is Ron Ballinger.

I would, actually, make it more formal and produce a document.

CHAIR PETTI: Ron, that's a good -- I had a question of Bob. We've all heard about trying to make sure you have equivalent levels of safety assurance to ensure that it's not -- that there isn't a disconnect here. Is there some process? Will a document be written? Will there be some sort of review done to assure that this happens?

MR. BEALL: I guess the review that we have for each of these individual rulemakings is going through the committees and the management reviews helps assure that they all have the same level of safety. I mean, I'm struggling with what your actual question was.

CHAIR PETTI: I mean, are you going to somehow document sort of this? And I just think that, from a legal perspective, there would be some sort of requirement to say that you've done some due diligence and you've gone through some sort of process, once

everything is almost final, to say, yes, we believe that this level of safety assurance is the same or similar.

MEMBER BALLINGER: Yes, this is Ron again.

I mean, I have no doubt that the staff sits around the table sometimes and makes sure that that's happening, at least in their judgment. But, sometimes, the process of producing a formal document that compares the two and assures this allows for the kind of finding of maybe gaps that you weren't thinking about earlier. And the review process by an organization such as the one that you're speaking to today might also contribute to that process as well.

MR. RECKLEY: Yes, Bob, this is Bill Reckley. If I can?

I'm not sure we'll be producing sort of a crosswalk document, but, as we do the Statement of Considerations for -- I'll speak to Part 53 -- these are areas where we will explain the content of Part 53 and, to some degree, we'll often parallel or explain the correlation to existing requirements and why we either kept them or Part 53 is providing an alternative.

So, I think, as we explain for each subpart the rationale, the explanation that you're

looking for will be there, albeit, it might not be in as crisp a crosswalk as what you might be hinting at.

MEMBER BALLINGER: Well, again, I come down on the side of Walt for sure. There are at least two parties that want to read this. One of them happens to be the public, and that's very important for them to understand that safety is maintained in this effort.

MR. RECKLEY: Yes, and again, I agree with you, and I think that is the narrative that we will be providing in both the rule text and in the Statement of Considerations.

CHAIR PETTI: You know, it might be worth something, members to think about, that when we get the Statements of Consideration and this gets close to finishing, that we've raised this issue; we could write a letter on this specific topic and affirm, hopefully, you know, that, in fact, we agree with the staff and kind of dot i's and cross t's. That might be a useful letter down the road.

MEMBER BALLINGER: That would get my --

MEMBER KIRCHNER: Sorry, this is Walt.

I think Bill Reckley's comment about the Statement of Consideration, I think, yes, that would probably be the document, Dave, that should flesh out

this set of considerations about level of safety assurance, and so on.

CHAIR PETTI: Right, right.

MEMBER BLEY: Well, this is Dennis.

From what many folks have said, when Bob said the rule would be ready to be issued in the complete form at the end of this year -- that's pretty soon -- does that include the Statements of Consideration?

MR. BEALL: Yes, it will. The package will be going to the Commission in February 2023, and all of that will be complete, The Federal Register notice, which includes the Statement of Consideration.

MEMBER BALLINGER: But the Statement of Considerations is not necessarily a widely read or widely announced document, is it? I mean, it's in The Federal Register. So, if you go to The Federal Register, you could read the thing, but it's not a formal document in the sense that the public could take a look at it, is it?

MR. BEALL: Yes, it will be made public, because the Statement of Consideration is in the beginning of The Federal Register notice, and the rule text is in the second half of the document, the same document.

MEMBER BALLINGER: Yes, I just wonder how many members of the public routinely read The Federal Register.

MEMBER BLEY: Well, a great many, especially the ones who listen into our meetings.

MEMBER BALLINGER: True, true.

MR. LYNCH: I'm sorry, this is Steve Lynch.

I think that's a very good point, that even if the Statements of Consideration and even the rule language fell, it may not be redlined by (audio interference), as produced in The Federal Register. But I think one of the things that the NRC staff can do to make sure that the contents of the rule language and the Statements of Consideration are well understood is to focus on our outward communication, whether that's coming to the ACRS members and talking through the Statements of Consideration. So that we are clearly explaining the safety basis and comparing that to Parts 50 and 52, as appropriate, and also, conducting public meetings with external stakeholders, whether those are vendors developing advanced reactor technologies or NGOs that are interested in the development of the rule, so that we can make sure that we are explaining our thought process.

Because I think, even when we release the Statements of Consideration, sometimes it's helpful, in addition to having something written, to explain things verbally and provide additional context to the NRC staff's thinking. So, I think that the note is well-taken that, as we continue to develop the Statements of Consideration over the next year, we are going to need to make concerted efforts to present on that and make sure that it is well-understood among the advanced reactor community.

CHAIR PETTI: Oh, and I think as we get closer, this could be a separate topic for a briefing and a letter. Because I personally think a letter from the ACRS on this topic would, of course, increase the visibility from a public perspective. And I think it would be something I would think a lot of the members would support.

MR. LYNCH: Sure. Absolutely, and we can work on finding an appropriate time to schedule that.

CHAIR PETTI: Yes.

MR. LYNCH: I just want to clarify that the Statements of Consideration are not set to be released right now with the remaining subparts this calendar year with the consolidated rule language in January, but it will be later in 2022, when we have

the Statements of Consideration ready. We are in the early stages of just getting started in writing that right now. So, I did want to clarify the timing of that.

CHAIR PETTI: Okay. Thank you, Steve.

MEMBER BROWN: This is Charlie. Can I?

CHAIR PETTI: Yes.

MEMBER BROWN: I've remained quiet up until now.

CHAIR PETTI: Okay.

MEMBER BROWN: I still have a hard time. I know when I first got here and I started looking at rules trying to figure out what the commercial world did, I didn't go hunting for Statements of Consideration. I looked in the rule for what the safety bases were, what the general design criteria were. And I don't see those in what we've got so far. I'm just struggling, and I have been when I started reading this again, with more of the changes.

So, I'm not a fan of Statements of Consideration being used 5 years, 10 years after the rule is issued. When this part is issued, that's where you're going to explain why we're doing what we're doing. If it's important, it ought to be in the rule, and not in some other document or some other

part of the statement that people really don't research and go back and look at years later. That's my personal opinion.

MEMBER BLEY: Just for clarification, the Statements of Consideration don't come after the rule. They come at the same time.

MEMBER BROWN: Yes, I've been trying to find them. I mean, you don't think about going back to Statements of Consideration. I went and looked at the rule for whenever we were reviewing something.

MEMBER HALNON: This is Greg.

Having run several licensing departments in the industry, I could assure you that the SOCs are high on the list, especially when a new rule comes out and you're trying to establish how you're going to comply with it. So, I'm not sure I can set your minds at ease, but I can tell you that, at least the licensing organizations I've run, if the engineer didn't read and understand the SOCs, then they were not part of the organization for very long. So, it's a high expectation in the industry to read and understand the rule, and the SOCs are part of that understanding.

MEMBER BROWN: Is that going to happen, though, 15 years later from that, when a new plant

comes along and somebody's going to say, oh, my gosh, I've got to go back and read the Statements of Consideration?

MEMBER HALNON: Well, by 15 years into it, hopefully, the rule language is well understood at that point and precedences have been set. Yes, the only problem is going back and retrieving, and that's the only issue that we'll ever have with this.

MEMBER BROWN: If it's in the SOC, then, like you say, it's going back and retrieving them. It ought to be in the rule. I understand your point about needing to understand everything, and you come from a place that had to do it. I came from a different world.

But it just seems to me -- I've said my piece. I'm just uncomfortable with not having the rule itself establish the safety basis for what we're doing, whether it be general design criteria, or whatever, which I'm still trying to figure out where they are.

MR. LYNCH: Clear. And one thing, I'll offer this again. It's Steve Lynch. One of the staff's goals with developing Part 53 is to make sure that the rule language is clear and concise and does not exclusively rely on context from the Statements of

Consideration for appropriate interpretation of the rule language. While the SOCs are integral to explaining the staff thought process in developing the rule, we do want to make sure that our rule language is clear and understood in how it should be implemented, as supported by guidance documents and additional context provided by the SOCs. But the comment is well-taken that rule language itself should be complete and well-understood.

CHAIR PETTI: Yes, Steve, I think one of our previous letters had a recommendation to that regard. So, it sounds like you're trying to make that effort.

Derek, I just want to ask you to put this issue of Statements of Consideration on our subject-specific topics sometime later in 2022, so I don't forget about it.

MR. WIDMAYER: Yes, sir, note taken.

CHAIR PETTI: Okay. Thanks.

Bob?

MR. BEALL: Yes, sir, I think I'm done.

CHAIR PETTI: Okay, okay.

MR. BEALL: So, let's move on to Marty, I think, for the next part.

CHAIR PETTI: Yes, Marty, please.

MR. STUTZKE: Yes, good morning, everyone. I'm Marty Stutzke from the Division of Advanced Reactors and Non-Power and Utilization Facilities, much easier summarized as DANU, in the Office of Nuclear Regulation. And I want to talk to you today about our initiative on graded PRA and the possible licensing pathways.

So, next slide, please.

MEMBER BLEY: Marty?

MR. STUTZKE: Yes?

MEMBER BLEY: Can I ask you an introductory kind of question? A few months ago when we were talking about this, at least what I heard was you expressed a feeling that you really didn't know how to go about the graded PRA. Now it seems you've changed your mind or you've found a good approach? If there's any introductory remarks about that, I'd be interested. Otherwise, we'll just hear your presentation as it unfolds.

MR. STUTZKE: You will hear that, Dennis, as part of my presentation.

MEMBER BLEY: That's good.

MR. STUTZKE: I'm just prepared to introduce my winding road viewgraph of the overview, as this effort has evolved considerably over the

summer and earlier this fall like that.

To that end, I would point out it's not just me, but there are three other people within NRR/DANU that are involved in this effort. I have three people from NRR Division of Risk Assessment involved in this effort; one from the Office of Research, Division of Risk Assessment; three attorneys from the Office of the General Counsel, and last, and not least, we have a consultant, Bob Budnitz. So, this is a rather substantial effort to try to address this graded PRA initiative like that.

I'll also speak a little bit to some of the previous comments about coordination. In addition to my serving on this Graded PRA Working Group, I'm also a member of the Part 53 Rulemaking Working Group, and I'm also a member of the Working Group that is developing Reg Guide 1.247, which addresses non-light water reactor PRA acceptability and endorsement of industry standards.

So, with that kind of an introduction, we'll lead into some viewgraphs here. I want to recap the history of how this effort has evolved over the past year or so, to give you an idea of where we're coming from and where we think we're going to.

So, next slide, please.

So, earlier this year, we formed this Working Group to discuss how to grade or right-size the PRA to support construction permit, operating license, design certification, standard design approvals, manufacturing licenses, and combined licenses.

And we envision a three-phase process. It's laid out here: to develop a graded PRA approach; then, to craft guidance, and third, consider alternatives to PRA that could achieve the same underlying purposes of conducting the PRA.

So, with that, we started out -- on slide 11, please -- and evolved some working definitions that you see here. And the idea was a graded PRA approach was one that would use bounding, conservative, and/or qualitative estimates to establish the scope, the level of detail, the degree of plant representation, and the level of peer review commensurate with the licensing stage like this.

Jumping to the bottom definition, we talked about dose consequence-based criteria that would enable the use of a graded PRA approach. Again, the idea is to make the underlying purposes of the severe accident policy statement with this.

So, slide 12.

We presented this at the advanced reactor stakeholders' public meeting in May, and we learned that industry was concerned at grading how the PRA was to be used in the licensing, not grading the technical content of the PRA itself. And there's a general recognition from industry and within the staff that the non-LWR PRA standard already offers opportunities to grade the content of the PRA.

The little graphic on the bottom is trying to indicate how you want to use the PRA should determine its technical content, and vice versa. In other words, the PRA always needs to be acceptable for its intended application.

MEMBER BLEY: Marty?

MR. STUTZKE: Yes?

MEMBER BLEY: Yes, that's a good point because I had forgotten that. That's a fair piece of the standard, when you have to go to show that what you're doing meets the needs of how you want to use it. That's a whole separate section, right?

MR. STUTZKE: Yes, and I'll talk about that in the next couple of slides, Dennis.

So, let's flip to slide 13, please.

The non-LWR PRA standard provides opportunities for grading the technical content in a

number of ways. The first obvious way is that it uses qualifiers when it writes certain supporting requirements, and you'll see some examples there. In other words, the supporting requirements are prefaced with phrases like for operating plants, then do this, or for PRAs performed during the preoperable stage, do that. And there are a number of supporting requirements that have no qualifiers.

MEMBER BLEY: I'm sorry, you got me thinking there. The second example is a good one, kind of except that was written -- well, I guess not. This was from the non-LWR PRA standard. So, for cases where you're trying to use the PRA as a strong part of your licensing process, whether it's preoperational or later, you're going to need certain things in there to make that possible.

I was going to say, you know, this was written before we were planning to use the PRA strongly in the licensing process, but that's not really true. This was written when they were considering that carefully.

Go ahead.

MR. STUTZKE: I think the Office of the Standards were fully cognizant of the NRC licensing processes. And I'll show you a little graphic in a

while about how the PRA evolves through the licensing process in a little bit.

But speaking to your earlier comment, Dennis, it's on slide 14, where Section 3 of the non-LWR PRA standard provides a risk application process. And I've tried to summarize it here briefly in the graphic. But the idea is how do you establish the capability of a PRA that's needed to support a particular risk-informed application?

Now, remember, you know, a risk-informed application, in general, was one that is using PRA to help support that application. We normally think about that in terms of risk-informed changes to the licensing basis, such as in Reg Guide 1.174.

But I would also point out, the initial licensing of a power plant, whether it's a construction permit, a combined license, or any of the other stages, are also risk-informed applications, and the PRA needs to have certain capability in order to support those applications.

So, the stages are laid out here; show you how you characterize, for example, the plant life-cycle stage; what you need the PRA to do, et cetera, et cetera; what to do if the standard is insufficient and it doesn't have requirements that are relevant to

the application, and a consideration or a comparison of the PRA, then, against those requirements.

This is actually a rather elaborate flowchart that's presented in the standard. I can't show you that without violating the copyright notice. So, you get to bear with me this way.

The other thing that I would point out is that Reg Guide 1.247 speaks about non-LWR PRA acceptability in general terms. It would apply to all license cycle stages. But specific guidance for the initial licensing has yet to be developed. There is some discussion in ARCAP and intention to develop further specific guidance on the scope and the level of detail of a PRA that would support certain licensing stages.

MEMBER BLEY: That's good. I think we're going to get briefed on that in the next couple of months, right?

MR. STUTZKE: Yes. In fact, they will mention it tomorrow. They're in the TICAP/ARCAP discussion to some extent.

MEMBER KIRCHNER: Marty, this is Walt.

Just quickly, does Stage A, B, C, D -- where does that fit in the life cycle of the licensing activities?

MR. STUTZKE: Well, those stages that you see here, A through E, you would apply during each life-cycle stage. So, in other words, you see the first bullet under Stage A is define what life-cycle stage you're in. And then, that is used, then, to determine which supporting requirements should apply and things like that.

MEMBER BLEY: Marty, if I may?

Walt, these are stages of the process for deciding if your PRA is good enough for an application.

MEMBER KIRCHNER: Yes, that's what I thought. Okay. Fine. Thank you.

MR. STUTZKE: Right. Yes, so you're always going through these stages.

Okay. Slide 15, please.

So, given this change in, we'll say, understanding, where the staff was focusing on grading the technical content of a PRA, and industry had expressed their desire to grade the uses of the PRA, we dug in and spent substantial effort trying to understand how the PRA is used in the licensing process; then, thinking, could we achieve those uses and roles with other techniques or tools? In other words, to achieve the same underlying purpose without

developing the full-scope PRA that's envisioned by the standard like that.

And then, last and not least, this understanding how that information fits into the overall approach for licensing under the various parts, Parts 50.52 and Parts 53. And generally, you can subdivide the uses of the PRA into required uses or expected uses. Required uses are things that are explicitly stated in rules or have been proposed in various rulemakings. That's different than the expected uses, which are conveyed through Regulatory Guides, various Commission Policy Statements, or Staff Requirement Memorandum, the Standard Review Plans, and even international documents like IAEA SSR-2/1. So, it's very, very important that it's clearly understood that things like Policy Statements and SRMs are not requirements per se.

So, to that end, let's go to slide 16.

Going way back almost to the start of my career, why do we do PRA? And I cite three references here. One is an ACRS letter that was written shortly after the accident at Three Mile Island, where the ACRS stated we think it's time to place the discussion of risk on as quantitative basis as possible.

That was later echoed in the Kemeny

Report, which was the Presidential Commission to investigate TMI. And again, notice the emphasis on estimating probabilities and consequences of accidents.

Finally, there was an internal study, the Rogovin Report that emphasized the best way to look at existing design, and to review them, is to rely on quantitative risk assessment.

So, from that -- going to slide 17, please -- you can see this following timeline that I've tried to lay out and sort into regulations versus Policy Statements.

Early in 1982, the Three Mile Island requirements were added to 50.34(f), which requires the performance of a PRA to seek improvements in the reliability in containment heat removal systems.

A few years later, the Commission issued its Severe Accident Policy Statement, which, basically, required expect the use of PRA to search for severe accident vulnerabilities.

Shortly after that was an Advanced Reactor Policy Statement that cited the Severe Accident Policy Statement and the forthcoming Safety Goal Policy Statement. That followed a month or so later, where the actual Safety Goal Policy was issued.

Also around that time, Part 52 was issued. And in there, the requirements indicated you needed to meet the TMI requirements in 50.34(f) and submit the PRA to the staff for review.

A small change to the Advanced Reactor Policy Statement for the metrification.

Moving up to the actual PRA Policy Statement itself in 1995 -- and we'll review each one of these in just a few minutes -- a major revision to Part 52 occurred in 2007, where applicants were no longer required to submit the PRA, but, rather, a description of the PRA and its results.

Shortly thereafter, a revision of the Advanced Reactor Policy Statement, to its citing the Severe Accident Policy Statement, the Safety Goal Policy Statement, and the PRA Policy Statement.

In 2009, the Parts 50.52 lessons learned rulemaking was initiated.

And in 2019, the Part 53 rulemaking was initiated.

I would point with some interest to that focus in the late 1980s. The other thing that happened during that time was the NRC relocated from its downtown Washington offices and Bethesda offices to the White Flint complex. So, this was a high-

activity period.

Next slide, please.

So, starting from the most recent, the Advanced Reactor Policy Statement -- and I've given you The Federal Register notices, if you want to take the time to look them up. I have also tried to summarize a great deal of the content in the following viewgraphs. So, if you don't have time or inclination, you can at least see what the Policy Statement says.

But there was a comment submitted by Toshiba that said, gee, the Advanced Reactor Policy Statement makes no mention about using PRA, and it would be real helpful to have Interim Guidance of a risk-informed, technology-neutral licensing framework.

To that, the NRC responded, well, we already have requirements for the use of PRA in Part 52. We've also issued Policy Statements, PRA Policy Statements, a (audio interference) Policy Statement. So, no further action was taken to respond to Toshiba's comment here.

Later on, in the Advanced Reactor Policy Statement, it is the expectation that the Commission expects advanced reactor design will comply with the Safety Goal Policy Statement.

Next slide, please.

So, here are quotes from the PRA Policy Statement again about increasing the use of PRA technology in a manner that complements the NRC's deterministic approach and supports the NRC's professional defense-in-depth philosophy. Notice PRA in this case is always playing a complementary or supporting role, and we'll talk about that in some detail a little bit later on.

Generally, use PRA and associated analyses in all regulatory matters, where practical, within the state of the art.

PRAs should be realistic, meaning no deliberately introduced conservatisms into the analysis.

And last, and not least, consideration of the uncertainties involved like that.

So, slide 20.

Again, from the Severe Accident Policy Statement. So, this was intended to convey the Commission's expectations on use or resolving Severe Accident Policy Statements, which were perceived to be as beyond design basis types of accidents here.

Notice it provides a definition of severe nuclear accident. Those in which substantial damage

is done to the reactor core, whether or not there are serious offsite consequences.

And as I'll talk a little bit later in my presentation, one of the challenges of the Graded PRA Working Group is coming up with a technology-inclusive definition of a severe accident, where in some designs focusing on the reactor core may not be so easy. It doesn't make technical sense.

However, okay, so continuing, the Severe Accident Policy Statement says we expect you to comply with existing regulations, and particularly points out the TMI requirements in 50.34(f); addressing all the unresolved safety issues; admitting high-prior generic safety issues.

The third sub-bullet, complete a PRA and consider the severe accident vulnerabilities. Okay? This is where the need for a technology-inclusive definition of severe accidents comes into play. When you think about telling someone to go off and look for severe accident vulnerabilities, you're obligated to tell them, well, what are you looking for? What is a severe accident and what would be a vulnerability to that?

And the fourth sub-bullet here is, again, this idea, use of deterministic engineering analysis

and judgment complemented by the PRA.

So, continuing to slide 21, use of the Safety Goal Policy Statement. So, quotes out of here.

Again, two qualitative goals. You judge that you meet the qualitative goals by looking at the quantitative objectives, sometimes known as quantitative health objectives like this. So, the risk to the individual in the vicinity of the plant, which was defined as one mile of prompt fatalities should not exceed 0.1 percent of prompt fatality risk. The risk in the vicinity of the plant over 10 miles of cancer fatalities should not exceed 0.1 percent of the sum of cancer fatalities from other causes.

And the cyclical Policy Statement also had a Commission recommendation that the staff should consider a general performance guideline large release frequency, and a suggested target for large release frequency, that it should be less than 10 to the minus 6 per year of reactor operation.

We'll talk during the next slide a little bit about this general performance guideline. But I would emphasize now it's interesting in that it is technology-inclusive. It doesn't require things like core damage frequency, or whatever, and it enables you to consider the design independently of the site.

So, slide 22, please.

So, the interpretation of the QHOs is shown in NUREG-0880. It says individual early fatality risk should be less than 5 times seven to the minus 7 per year, individual light and cancer risk less than 2 times 10 to the minus 6 per year.

The staff has periodically reassessed those numbers. One would expect medical technology is better; people are generally more healthy. And so, the risk of cancer should be decreasing over time, but we've not seen it necessary to readjust these numerical guidelines as of yet.

During the development of these risks, or of these quantitative healths objectives, the staff has always borne in mind that surrogate risk metrics would be very handy to have. Rather than doing a PRA that goes all the way out to consequences, it would be useful to be able to zero-in on things like core damage frequency and individual early fatality risk. The derivation of those is actually shown on NUREG-1816, which was done decades after the safety goals were originally written down.

An important thing on this viewgraph is to realize that the non-light water reactor PRA standard does not use any risk surrogates. And there's no core

damage frequency, no large release frequency, and no Large Early Release Frequency mentioned in that standard.

We address the use of risk surrogates in Regulatory Guide 1.247, and, in fact, actually received a comment from industry saying that may not be what you want to do, because, again, the standard does not address it.

Slide 23, please.

So, recap of the history on large release frequency. And as I had indicated before, the Commission spoke through an SRM back in 1989 that says the large release guidelines -- in other words, LRF -- should apply to all current and future reactor designs. And they also reminded the staff that adequate protection is a case-by-case finding. In other words, that is the prerogative of the Commission.

You may be curious, where did the 10 to the minus 6 number come for the large release frequency? And I found an email from Forrest Remick, a former Director of the Office of Policy Evaluation, who was tasked with developing the safety goals. Dr. Remick later was an ACRS member and a Commissioner.

And he had sent an email to James Taylor,

the then-EDO, that explained where the 10 to the minus 6 came from. And apparently, it's an interesting story to me that there was a deadlock between the ACRS and the staff on the use of core damage frequency and conditional containment failure probability. Where the staff only wanted to include core damage frequency, the ACRS also wanted a conditional containment failure probability metric.

Unresolved, and so, Dr. Remick, apparently, received a call from an assistant to the then-Chairman Palladino that said, well, maybe we can get out of this by dropping both CDF and CCFP and substituting a Large Release Frequency guideline, 10 to the minus 6.

So, the logic was you assume 10 to the minus 4 per year core damage frequency times a conditional probability of vessel breach, what Dr. Remick called core on the floor, of 0.1 times the conditional containment failure probability, .1, and, boom, you get 10 to the minus 6 per year. And that's why it was incorporated under the Safety Goal Policy Statement as it was.

A little bit later on, like this, the staff had asked whether we should transition from Large Release Frequency to Large Early Release

Frequency at the time of fuel load. And the Commission approved that.

Later on, the Commission asked the staff to develop a history of Large Release Frequency, and I've referenced it there. What happened was, in the early '90s, the staff tried to anchor or calibrate that Large Release Frequency guidance to the QHOs, and they were, basically, unable to do it. What they found was that LRF was much more conservative. And so, the conclusion and recommendation at that time was, well, we can't do this; it's not really practical to do it, and we don't need to do it for regulatory or design purposes like that.

MEMBER BROWN: Marty?

MR. STUTZKE: Yes?

MEMBER BROWN: This is Charlie.

I'll look back at 22. And doesn't this, the last two bullets down here, effectively, establish a de facto surrogate --

MR. STUTZKE: They do, but --

MEMBER BROWN: -- for non-light water PRAs?

MR. STUTZKE: Well, they do for large light water reactor PRAs.

Can we scroll backwards to slide 22,

please?

MEMBER BROWN: Where did I lose the bubble?

MR. STUTZKE: Okay, but they only apply to large light water reactor PRAs because they are based on the results of NUREG-1150 analysis, which applied to large light water reactors. So, in other words, if one had a smaller reactor or a non-light water reactor, less thermal power, in principle, the core damage frequency could increase because the conditional consequence is much lower.

MEMBER BROWN: Oh, but the non-light water PRA standard doesn't say large or small. It just says non-light water.

MR. STUTZKE: Right, but --

MEMBER BROWN: I still lost the bubble.

MR. STUTZKE: Okay. What the non-light water reactor PRA standard is trying to emphasize is we can't meaningfully define core damage for certain non-light water reactor designs.

MEMBER BROWN: Okay.

MR. STUTZKE: In other words, in light water reactors, we define core damage by things like, gee, the peak clad temperature, or peak centerline temperature exceeds 1800 degrees Fahrenheit --

MEMBER BROWN: Yes. Yes.

MR. STUTZKE: -- before the core starts to uncover.

MEMBER BROWN: Right. Okay.

MR. STUTZKE: That doesn't work well for high-temperature gas cooled reactors. So, you would have to have a technology-specific definition of these various risk surrogates, things like CDF.

MEMBER BROWN: Okay.

MR. STUTZKE: The other thing is that the non-light water reactor PRA standard was also developed with an eye towards supporting the Licensing Modernization Project, which requires the full Level 3 PRA. Remember, the frequency consequence curve was plotting the frequency of releases on the Y-axis versus the consequence on the X-axis.

MEMBER BROWN: Yes. Okay. All right. So, there's nuances in there.

MR. STUTZKE: Yes. Yes.

MEMBER BROWN: You almost need a family tree to go trace what goes with what, as opposed to just the bullets.

All right. Thanks.

MR. STUTZKE: Yes. Surely.

Let's go to slide 24, please, in this.

Okay. So, having been a little bit thwarted about the definition of Large Release Frequency units and its general conservatism when applied to anchoring it to the QHOs, industry evolved the concept of Large Early Release Frequency. And that was done by the Electric Power Research Institute in a PSA Applications Guide, as I've shown here.

And the idea is you could use qualitative characteristics to identify sequences that were large early releases. And the early in the sequence, in the description, was added to convey the release occurs before the effective protective actions could occur, such as evacuation like that. But, again, the idea is it avoids the need to do any source term work or radiological consequence work. I would also like to point out the lead author on that document is Doug True, who's now the Senior Vice President at the Nuclear Energy Institute.

So, staff adopted the concept of L-E-R-F, or LERF, when it developed Reg Guide 1.147. And I've provided a definition of L-E-R-F which is contained in Reg Guide 1.200. The sum of the frequencies of accidents leading to rapid unmitigated release of airborne fission products occurring before the effective implementation of emergency offsite

response. And notice the parenthetical phrase, that's an example of the types of characteristics that are used to identify large early release sequences.

MEMBER BIER: Marty?

MR. STUTZKE: Yes?

MEMBER BIER: Sorry. This is Vicki Bier.

I don't think this is exactly a question, but you had mentioned that the LERF was designed to be before any evacuation or relocation had taken place. And I think one of the things we saw from Fukushima is that relocation can acceptably contain dose, but imposes large hardships on the population; that if you get into a situation where you need relocation, the utility or the plant owner is, essentially, relying on the relocation of the population as almost like a safety system, which is probably not what many people in the population have in mind.

MR. STUTZKE: Yes, Vicki, I agree with you. And it's interesting, I've had the benefit of some discussions with our Canadian colleagues, and some of them are oriented towards a measure of societal disruption. So, just the fact that you have a release that would necessitate an evacuation, or worse, a relocation for long term, is a major impact on people, even if there's no minimal radiological

hazard involved.

MEMBER BIER: Okay. Thanks.

MR. STUTZKE: Yes.

So, slide 25.

Now I want to refer to some definitions that are used in risk-informed regulation. And the primary source of this is a white paper that the Commission issued in DRM SECY-98-144, where they defined the risk triplet -- what can go wrong; how likely is it; what are the consequences?

The risk triplet was actually invented back in 1981 by Stan Kaplan and Big John Garrick in a paper. I've given you the quote down there. And what's interesting is the title of the paper is The Quantitative Definition of Risk. So they had always intended -- and, in fact, the paper is, in my opinion, highly mathematical. I've given you in the inset box there their equation for the risk triplet, including all of the uncertainty distributions on the frequencies and the consequences. I point that out because people tend to think of the risk triplet more qualitatively, but it's, in fact, a very precise quantification that was supplied here.

But, continuing with that, again, the SRM, the SECY-98-144, says, well, a risk assessment is just

a systematic method for addressing the risk triplet. Notice that it doesn't say that it needs to be a quantitative approach. And risk insights are results that come from the risk assessments and a risk-informed approach, then, is based on risk insights considered along with other factors like this.

That's in contrast to the definition of PRA, shown on slide 26, please, where PRA, again, you'll see a systematic method for addressing the risk triplet. But notice the use of PRA to determine a numerical estimate of risk. That definition is then transferred over to Reg Guide 1.200 and Draft Reg Guide 1.247, where it says an approach is considered a PRA when it provides a quantitative assessment of the risk -- again, in terms of scenarios admitting specific technical elements.

So, according to this definition, techniques like seismic margins analysis are not PRA because they are not quantitative. They don't estimate the risk. And that's specifically why those definitions were added like they were like this.

Okay. Let's go to slide 27 then.

I had talked before where we were considering within our Graded PRA Working Group about the role of the PRA and how it's used in initial

licensing. And early in the spring, I had invented the phrase PRA in a leading role and another phrase, PRA in a supporting role.

And having carefully reread the PRA Policy Statement, I came to the realization PRA is always used to support and complement the deterministic approach. So we relabeled the phrase PRA in a supporting role as it's a traditional role. And what we mean by that is PRA as it's been used in previous design certification and combined license applications.

And that specifically includes searching for the severe accident vulnerabilities, as expected by the Severe Accident Policy Statement; PRA used to meet the TMI requirements in 50.34(f)(1)(i), which applies to Part 52 applicants to perform a site-specific PRA. Again, notice the phrasing PRA in there. Third sub-bullet, demonstrative quantitative health objectives are met, required by the Safety Goal Policy Statement, and using PRA in the design process in the PRA Policy Statement.

So, we now can consider an enhanced role of PRA, which is, basically, anything beyond its traditional role. For example, as we indicate in the preliminary rule text for Part 53, use of PRA to

identify licensing basis events; classify system structures and components; evaluating defense-in-depth.

The enhanced role of PRA, then, also includes any voluntary risk-informed applications, such as risk-managed technical specifications; risk-informed fire protection; risk-informed in-service inspection, et cetera, et cetera.

So, I hope that this language clarifies it a little bit. I will try to show you in a few more slides how it plays out in possible licensing pathways.

MEMBER DIMITRIJEVIC: Marty?

MR. STUTZKE: Yes?

MEMBER DIMITRIJEVIC: Hi. This is Vesna Dimitrijevic.

As you already mentioned, there is a public view of that, but I want to discuss the main point I think you're trying to make, that the PMA actually implies the quantitative results of the risk; actually quantification of the risk. And that's through the PRA quantifies the risk; there is no doubt about that.

The one thing which I want to bring up is the importance and use of those numbers. So, let's

say that we look in the first, the PRA document, where the PRA and everything becomes a public response. And there is some generation of us which we remember the response very well, and we look at this. But I bet you that none of us actually remember what was the core damage frequency presented then. What we mostly remember is what that started to identify is important contributors. And a small LOCA, which happened very soon after what happened in Three Mile Island was identified as one of the main risk contributors from that study.

So, the point I was trying to make is that those numbers were not used as absolutes, and the values of the PRA was never, in my opinion, in producing absolute numbers, but if anything comparison or what are the important contributors to the risk? And also, when you look at using PRA in the risk-informed application, it is also in the assessing delta change in the risk measures.

So, it's that, you know, 5.34, 10 to the minus 5, or 6.7, 10 to the minus 6, through the use of the PMA becomes irrelevant. What becomes relevant is to identify the plant vulnerabilities. And so, if the point of the view is the numbers, the values in the risk assessment is developing components which comes

out as an important contributor to the risk.

And the one other point which I want to say, if anything, the actual number, it's just the likely importance is just in the likelihood, then we will leave it much more concentrated. Are we producing mean values, I mean, providing point estimates? Have an actual incentive? Let's say that we really want to deal with the mean values. Then, how would, actually, uncertainties quantify? You know, is it independent or is it related the components? So, there is so many more issues which come up if we are just interested in the numbers and not in the relative comparison of contribution to the risk?

MR. STUTZKE: All right. I agree with you wholeheartedly.

One of the beauties of PRA is its ability to rank-order contributions to risk according to various criteria. I'll just relay that was drummed into my head when I was in graduate school. I'm a student of Jerry Fussell. So, yes, I've always had an infinity for importance measures like that.

But, that being said, you know, the Safety Goal Policy Statement if fixated on the bottom-line number. In other words, how safe is safe enough? So,

in a certain way, it's providing a speed limit on the overall risk of the plant.

MEMBER DIMITRIJEVIC: Yes, but you provide it in such a large brackets, it's not really saying, you know -- it's saying 10 to the minus 4 or 10 to the minus 6 -- it's not saying some specific number. And when you look in these large brackets, then it's much easier to prove that that goal is met without doing the detailed breakout.

MR. STUTZKE: Yes, I agree.

MEMBER BLEY: I'd like to jump in just a little. I agree with most everything the two of you have just said, except the complete dismissing of the absolute value of risk and the importance of the uncertainty treatment. And if you don't include that, you don't know how important it is to deal with any of those nicely ranked potential problems in the plants. You can't do it without both, and I think both are important. And I think that's where you're headed. That's what it looks like.

MEMBER DIMITRIJEVIC: Right. That is, I completely agree with that. I just want to say that treatment of uncertainty is in the pioneering stage anyway in regulation and Reg Guides. Because if the treatment of uncertainty was done in the necessary

details, whenever somebody comes to you with a point estimate, and meanwhile, you're equal, you will just return that PRA, because that cannot be true.

MEMBER BLEY: Yes.

MEMBER DIMITRIJEVIC: So, therefore, we are still really in the infant stage of treatment of uncertainties.

MEMBER BLEY: I kind of disagree. There's been an awful lot of work over the last almost 50 years in that area and it's well done.

But I will admit, Marty, that your former mentor in a public meeting once accused me, Stan Kaplan, and John Garrick, of pulling off the greatest hoax in the history of science by focusing on uncertainty.

(Laughter.)

MR. STUTZKE: Yes. Let's say one of the things -- and I think our Project Manager for this Graded PRA Working Group has come to appreciate -- that managing PRA experts is like herding cats, and there's a lot of very strongly held opinions by the various practitioners. But what I would hope is that we all, collectively, agree, you know, PRA provides a very elegant framework for considering all of these uncertainties. It's not perfect, but it's the best

that we know right now.

MEMBER BALLINGER: I'm told that dogs have owners, but cats have staff.

(Laughter.)

MR. STUTZKE: Anyway, let's flip to slide 28 and continue this.

I had mentioned this before. This graphic lays out the various life-cycle stages that are recognized by the various parts. So, I've color-coded my Part 50, 52, and 53.

Starting in the lower left corner, the construction permit, where we actually know what site we're going to build out, then feeds into the operating license, as shown there. The design certification, manufacturing licenses, standard design approvals are independent of a site like this, and they can feed into the combined license under Part 52 or Part 53, or they can be used to base a construction permit on like that.

Once the operating license or combined license is issued, the Fuel Load PRA can begin like that. At that point in time, the plant is physically constructed. So, you can walk it down and obtain the information you need to refine the PRA models. In addition, all the operating procedures are available,

which is an important input to the human reliability analysis. And finally, with commercial operations, experience occurs, statistical data can be collected, and the estimates of the probabilities can be refined like that.

But the important thing I'm trying to convey is, as the plant is constructed, goes through the various life-cycles stages, as shown here, the PRA is increasing its level of detail and its degree of plant representation like that.

So, that needs to be borne in mind. You know, not all of the uncertainty of the PRA shows up as numerical, in the numerical results. There's always the uncertainty about, gee, I'm applying generic data to construct some permit stage because I don't have any operating experience. And there's the question of the exchangeability of that generic data with the point you're actually trying to model. In other words, is it truly representative?

So, I try to bear that in mind, as I think about PRA and its uncertainties. Although, I admit, I love the mathematics of uncertainty calculations and all of that, it doesn't always get to the root of the problem.

MEMBER BLEY: I'd jump in just a little

bit, Marty.

The uncertainties are there in the real world. PRA is just trying to quantify them in a way you can see them and deal with them mathematically. It doesn't make up the uncertainties.

MR. STUTZKE: That's true. I've been accused of that before; it's only uncertain because the PRA made it uncertain, and that's not the case.

MEMBER BIER: Marty, this is Vicki again.

I wanted to point out that there is other differences between the various stages, in addition to just plant-specific data. Hopefully, by the time of a construction permit, you have a detailed design, not just design certification stage, but there can also be differences between the as-designed and the as-built. And sometimes the waivers that approve an as-built modification may not have thought through all the implications that would show up in a PRA.

MR. STUTZKE: Yes and no. At the construction permit, it's largely a conceptual design, and that's why the importance of principal design criteria stands out then. So, it's like when we go to the detailed design process, these are the criteria we're going to use to get down to the brass tacks of the problem like that. Then, by the time the

operating license comes around, that PRA would be upgraded and refined to represent more detail. It's in contrast to the combined license, which requires an, essentially, complete design because it's a one-step license process.

MEMBER BIER: Got it. Thank you.

MR. STUTZKE: Yes.

To slide 29.

MEMBER REMPE: Oh, Marty?

MR. STUTZKE: Yes?

MEMBER REMPE: That may be true with Part 52. But, as we've seen with the experience with the AP1000, there were ITAAC and there were changes. And again, I'm thinking of this request for an example and Walt's statement about equal levels of safety. There's not a final review to make sure that the cumulative changes that occur as one goes through the construction process with Part 52 is, indeed, conforming with what was intended when they got the DC.

And as you go through the next couple of slides, it seems to me that the risk assessment might be the tool to assess the cumulative effects of changes during construction with Part 52. And then, I'm wondering how that example or how one will deal

with that in Part 53. Is what I'm saying kind of making sense?

MR. STUTZKE: Yes, it certainly makes sense, Joy. And, you know, the challenge the staff faces is that we have to issue either a combined license or an operating license, based on the information that we have available at the time. Then, you know, in the case of the combined license, then, the plant construction actually begins and it's inspected to ensure that it meets all of the requirements, you know, the ITAACs, and things like that. But they already have permission to build that plant. There is a whole point where we decide everything is good to go, and then, we grant permission to load fuel like that.

So, the point is, you don't really know or have the final set of PRA information up until you get the fuel load, but you've already granted authority to start up the plant by that time. So, there's always this uncertainty involved.

MEMBER REMPE: Yes, the PRA would be a way to -- I mean, you've got different inspectors saying, yes, they met this ITAAC and that ITAAC. But the accumulation of some minor variances -- yes, they met the ITAAC, but are there some unintended small

changes? I know this has been a think that Harold Ray used to bring up a lot. And so, again, I'm thinking of Part 50.52 alignment issues.

And your subsequent slides really emphasize where I think that the PRA, and how the licensee braids the PRA in the Part 52 process, could be a tool that would provide confidence that, yes, all these changes as the ITAAC were met did, indeed, not affect the safety of the plant. And then, again, as you go back to what's happening with Part 53, that type of insight ought to be retained.

MR. STUTZKE: Sure.

MEMBER REMPE: If that makes sense, what I'm trying to get to?

MR. STUTZKE: I think I understand where you are.

So, with that, let's move to slide 29.

CHAIR PETTI: Marty? Marty?

MR. STUTZKE: Yes?

CHAIR PETTI: It's close to our break time. And we could either get through slide 31 and break or we could break here. I'm thinking maybe break here because, now, you're going to get into sort of the details.

MR. STUTZKE: That would be fine with me.

CHAIR PETTI: Okay. So, folks, let's take a 20-minute break. Be back by 20 after the hour.

We're in recess. Thank you.

(Whereupon, the above-entitled matter went off the record at 10:59 a.m. and resumed at 11:20 a.m.)

CHAIR PETTI: Okay, it's 20 after.

So, Marty, continue.

MR. STUTZKE: Yes. So, moving to slide 29, currently, PRAs are not required for construction permit or operating license applicants. The Commission stated its expectation that the Severe Accident Policy Statement and the other directions related to the use of PRA would also apply to new Part 50 applications, consistent with how they currently apply to Part 52. And that's one of the reasons why the Part 50.52 lessons learned rulemaking was undertaken, was to incorporate those PRA-related requirements for CP and OL applicants like that.

So, slide 30, please.

This is a list of all the specific regulations for Part 52 applicants -- design certifications, combined license, standard design approval, and manufacturing applicants.

And again, the requirement for COL

applicants that reference a standard design approval or a design cert or a manufacturing license should start with that PRA, and then, update it.

Again, two things that I would call to your attention.

One is the description of the PRA in the results, as opposed to the original Part 52 language that said: submit the PRA to the staff.

The second, and perhaps more important, aspect here is, you'll notice the rule language does not tell you why you are submitting this. In other words, what is the intended use for this? Hold that thought in mind.

Go to slide 31, please.

These are the requirements that are for Part 52 combined license holders that appear in 50.71(h). It says every COL holder needs to develop a Level 1 and Level 2 PRA and address the initiating events and modes and NRC-endorsed consensus standards that exist one year prior to initial fuel load.

That last thing is kind of moot, in the sense that the non-LWR PRA standard already addresses all initiating events and all operating modes of the plant. That's not the case for light water reactors, where there are various tri-use standards initiated

for low power and shutdown, things like that.

Again, in 50.71(h)(2), requirements to maintain and upgrade the PRA every four years.

And finally, by the time of license renewal, if you haven't already addressed all the modes and all the initiating events, you're now required to do so. But, again, notice the language here doesn't tell you why you are required to maintain this PRA.

So, slide 32.

This is excerpts from the third iteration of preliminary rule text for Part 53; specifically, Section 53.450(a), required to have a PRA to identify potential failure modes, et cetera. The area that I've highlighted in yellow, that's telling you why. That's a link back to the Severe Accident Policy Statement, which is obliging the user to search, use the PRA to search for severe accident vulnerabilities.

And again, the highlighted blue area demonstrates that you meet the safety criteria in 53.220. Those are the QHOs. So, again, this language is telling you why you're using the PRA.

And to respond earlier to Charlie's comment, that obviates the need to go back to all of these Statements of Considerations to figure out why

you're doing what you're doing. It's, in fact, embedded into the rule language here.

Part 53 goes on, as shown in slide 33. It has specific uses of the PRA are required. Selection of the licensing basis events; classifying the system structures, components, and human actions, and evaluating defense-in-depth. And according to the definitions I've given you before, those are required enhanced uses of the PRA.

To the blue highlighted area, Subparagraphs 4 and 5, basically, these lay out the required scope of a PRA. All plant operating states; uncontrolled releases of radioactive material, which would imply you would need to look at all sources. And that means not just the reactors, but you would need to look at multi-reactor accidents. You would need to look at non-reactor sources, like spent fuel, et cetera.

Subparagraph 5 talks about the need to look at all hazards, such as all the internal events -- transients, loss of integrity -- as well as the external hazards, like earthquakes, high winds, et cetera, et cetera.

Okay. Slide 34.

MEMBER BIER: Marty?

MR. STUTZKE: Yes?

MEMBER BIER: Before you move on, this is Vicki again.

I have a couple of questions with regard to, oh, I guess it's the first bullet point about determining the licensing basis events.

First, my understanding is that would come pretty early in the design process; that may be before a complete plant design is available. Is that correct?

MR. STUTZKE: That's correct.

MEMBER BIER: Okay. So, you know, on the one hand, we saw with large break LOCA before PRA that we weren't always good at choosing what events to focus on when we didn't have risk guidance. But, on the other hand, this will also be early enough in the process that I assume this doesn't preclude later use of the PRA in more of a confirmatory role after they have these licensing basis events chosen?

MR. STUTZKE: Yes, that's also correct. When you actually look at the O&P flowchart, there are numerous feedback loops.

MEMBER BIER: Got it. Okay.

MR. STUTZKE: As the design is evolving, the PRA is evolving, and you're constantly checking.

MEMBER BIER: Okay. So, the other thing I wanted to raise is, is it intended that the LBEs were chosen by, say, the vendor of the plant designer, or who's actually making that choice?

MR. STUTZKE: Yes, those are chosen by the designer.

MEMBER BIER: Okay. Because the DBEs in the olden days were chosen by the regulator, and the designer had to meet them. I gather, obviously, there will be some kind of review process, but it seems like there are some tradeoffs.

On the one hand, the designer is, obviously, going to have a much better understanding of the design than NRC staff, especially, with this proliferation of a zillion different new designs, that the staff can't be 100 percent expert in every single design that's coming down the pike. On the other hand, it seems like there may be a risk of design, you know, or AE firms deliberately choosing LBEs that are, in a sense, going to be easy to address. And have you thought about how to look for that in the review process?

MR. STUTZKE: Yes. As you point out, the process for selecting the LBEs is highly plant design detailed. In other words, you know, it's not feasible

for us to a priori lay out, you know, this is the definitive list of licensing basis events, because some designer will always come up with a new twist on a design, or something like that. So, LMP, in general, spares that burden on the designer --

MEMBER BIER: Uh-hum.

MR. STUTZKE: -- through an iterative process.

What I would say is we highly encourage the pre-application interactions with the staff like that. Once we get an application in the door, you know, that list of design basis events is, more or less, cast in stone, in the sense, they proposed it, and it makes it very difficult to change people's opinion at that late stage in the process like that.

MEMBER BIER: Right.

MR. STUTZKE: So, yes, pre-application interactions are key, I think, to making this thing work.

And the other thing is, during the design processes, the design gets evolved and the PRA is upgraded. The staff is not necessarily privy to that process. We only get to see the final results.

MEMBER BIER: Yes.

MR. STUTZKE: So, anyway, we'll speak a

little bit more about some ideas that we've had to provide further guidance on this in a couple of more slides.

MEMBER BIER: Super.

MEMBER BLEY: Marty?

MR. STUTZKE: Yes?

MEMBER BLEY: Your statement that they would be cast in stone at the application, that can't really be true. Because if you find some initiating event or scenario that could be a significant risk contributor that they didn't have in their list, they're going to have to deal with it. So, they're taking on a risk, if they don't address these with you ahead of time.

MR. STUTZKE: Yes, I understand that, and maybe I'm being a little exaggerating. But the fact is, you know, the application comes in and that's what the applicant has proposed, and we need to react to it.

The other thing is, once the application comes in the door, you know, the staff is in a reviewer type of role. One of the strong lessons I learned early on in my career at NRC is the staff is not here to provide engineering expertise to licensees.

MEMBER BLEY: Well, it certainly strikes me that, if we're going to -- and there really isn't much choice -- use the PRA as a stepping stone to getting at the design basis events, you guys need to do a little more than just review what's there. You have to make sure that they've included what's important, because, to me, that's a key role of the regulator.

MR. STUTZKE: Yes, sure, and we do have processes like requests for information, and things like that, that we can go after it.

MEMBER BALLINGER: This is Ron.

I'm assuming you can get the peer review, which I presume gets performed in the development of the PRA by the applicant, right?

MR. STUTZKE: Yes and no. The standard requires the peer review. We have not expected the peer review to be done for design certs and combined licenses as yet.

MEMBER BALLINGER: It may be that that's something to consider, because it gets you one step below. I mean, it helps to at least try to get at what Dennis is referring to.

MR. STUTZKE: That's right.

MEMBER BLEY: Well, you know, it's been

easy since the mid-sixties, because we had really lots of different people and organizations that thought through the kind of what could go wrong sorts of scenarios and came up with a set for large LWRs. You still need to double-check that you haven't missed something important.

But this strikes me as, you know, we're going kind of back to where we were in the late '50s. At that time, this Committee was the regulator's primary technical reviewer, and a lot of their effort -- and if you read their old documents -- was going through and seeing, could I break this thing somehow that the applicant hasn't thought of, and if so, they'd better consider it carefully. And I think that role falls on you. Especially now if we're looking at new designs, we can't rely on past applications and expertise on very similar systems.

MR. STUTZKE: Yes, the one thing I would add is that it's been our custom to do a PRA audit prior to the application. So, not just relying on the description of the PRA and its results, but going onsite to an applicant's office and looking in detail at all the PRA models and how it was constructed, and things like that.

MEMBER BLEY: Now, to Ron's question,

although you haven't been asking them for the peer review, my understanding of how these days utilities and others are using peer review is, if they get findings that say you're missing something, they have to address those. And I would think NRC would at least see a record that there had been a peer review, and that all the relevant issues were resolved. Is that true or is that a gap sitting there?

MR. STUTZKE: Yes. Yes, if they do a peer review, we would expect them to describe it and provide all the facts and observations, and how they've been addressed.

MEMBER BALLINGER: Yes, what I'm trying to get at is some means by which you can verify what the process was or what they did to develop the PRA, you know, the underlying documents, so to speak.

MR. STUTZKE: Right, and, you know, in addition to that, those would also be summarized in that description of the PRA as, what techniques did you use? You know, what were the ground rules, that sort of thing.

MEMBER DIMITRIJEVIC: This is Vesna.

I just want to say like, since I was at Framatome, we did a peer review of the EP audit. NRC requested that we report all the findings.

When it comes to that, so peer reviews are not something which takes a long time. They're done in, readily admitted, time of a couple of weeks. So, therefore, they require high expertise of the people who are performing this peer review.

And when we start dealing with the new designs, it will take some time to develop expertise in that area. So, it's not really clear how effective peer reviews would be for the new designs in the beginning of those designs being introduced, especially, I mean, the new PRA. So, I don't know, would the PRA review really help so much in these situations?

MEMBER BLEY: Well, we'll certainly chase that on any of these applications.

You're going to get to a slide in a couple of slides that describes some places I hope we'll be focusing your reviews. And one of those is the comprehensive search for initiators and event sequences. And that's kind of crucial, no matter which of the pathways you're going to talk about that are used. And I don't see any choice but you looking at those with great care and looking at the process that the applicant used to come up with those lists. So, we'll hear more about that from you in a few

minutes, I would expect.

MR. STUTZKE: Yes. Yes.

MEMBER BIER: So, another comment, and then, I see Walt also has his hand up.

I think there's kind of two separate issues of the kind of quality review of the PRA, but if you look at, historically, with PRAs of the current LWRs, it took a decade or more for the methodology to really mature. So, you know, gee, we need a Fire PRA; we didn't think about that. There's a whole period of time to develop what a Fire PRA should look like. Common cause was in WASH-14, but the way it was in is not something that today would be considered acceptable. It took a while before people figured out, oh, there's better data-driven ways to do common cause failure analysis, et cetera.

And so, you know, the process of reviewing a PRA for a new reactor design, where we haven't yet had that learning experience, you know, that there's a magic answer. Not doing the PRA doesn't solve the problem. But has the staff thought about how they will try to address the novelty factor?

MR. STUTZKE: Not to any great detail. I mean, we would certainly anticipate the state of the art or the state of practice in PRA is going to

evolve, as we see more and more non-LWR PRAs being developed. And that could spur various research, things like that.

The other thing that I would point out is the requirements currently for COL holders to upgrade the PRA, and those upgrades require peer reviews. And then, the results of that would be reported to the staff probably as an update to FSAR, and we could see, oh, the PRA results are changing; why is that? And it affords the opportunity to dig into it to decide, you know, do we agree why the things are changing? Do we understand, that kind of thing.

MEMBER BIER: Uh-hum.

MR. STUTZKE: So, yes, it will be an evolutionary process; there's little doubt in my mind.

MEMBER KIRCHNER: Just to follow onto Vicki's comments and Vesna's -- this is Walt Kirchner -- my concern, Marty, is along these lines: if you take this approach with sub-bullet 1 there, and you determine the licensing basis events based on your PRA, the next thing you do is in bullet 2. And so, what are the quality assurance requirements for that PRA? I mean, you are now determining your licensing case, based on the PRA. Then, you classify systems accordingly. That classification results in different

quality assurance requirements, whether they are safety-related systems or not. It's all coming out of this initial -- Dennis mentioned it -- you know, this comprehensive search for what are these illuminating events that comprise the design basis events?

And I think you said that, for example -- I wouldn't put my hat just on the peer review -- but did you say that the peer review would not be required at the initial stage of submittal?

MR. STUTZKE: Yes, currently, the staff would waive the requirement to do the peer review at early stages of the submittal, and that would be replaced by the staff's own review of the PRA.

MEMBER KIRCHNER: that goes to the comments that Dennis made then. But that, to me, is of concern. If you're hanging your hat on the PRA, why is it not peer-reviewed before you actually -- because they're going to, then, put these licensing basis events in front of you, and then, they will go systematically through, and then, classify their SSCs. That will require determining which ones are, I'm going to say, NQA-1 versus not, et cetera, et cetera.

If this is the approach, I would -- I'm searching for the right words. I know the PRA can't be complete so early on, so to speak; that it's a

living document, if you will. But it seems to me it has to, one, go under some kind of design and configuration control, if, indeed, it's the basis for the safety case.

It's not a question of just updating it as you learn and go. It's got to be under design configuration control.

MR. STUTZKE: Well, and the standard requires the PRA to be under configuration control.

MEMBER KIRCHNER: Okay.

MR. STUTZKE: And that's one of the things that would be checked, either under peer review or as we would do it.

The other thing that I would point out, you know, as far as identifying the LBEs and classifying the SSCs, it's not a purely mechanical process where you look at the results of a PRA, and if it's falls into certain categories, boom, there's the answer. It's supplemented by engineering judgment from an integrated decision-making panel that the applicant conveys.

MEMBER BLEY: And Walt's comments were heavily focused on the PRA part of this, but we're going to see shortly there are alternative approaches, including a deterministic one. But, whichever way you

go getting this list of initiators and events sequences that can be damaged complete, this is essential in having a structured process that can be reviewed; it is crucially important. And that's not a PRA issue. These ideas may have been developed during work on PRA, but they're equally applicable if you go the other way. And if wait a couple of slides, maybe Marty can help clarify.

MR. STUTZKE: Charlie, you have your hand raised?

MEMBER BROWN: Yes, I do, but I need to go back a slide, when you're all finished. That's why I've stayed quiet.

Marty, I guess my question comes -- you referred to my earlier comment relative to how this got incorporated. So, I appreciate that.

But it seems to me you've buried this -- and that's not a critical statement; I'm not trying to be criticizing -- in Subpart C, Section 53.450. And yet, when I go back and look at Part B, 53.2, you define safety objectives. And it would seem to me that this would be more appropriately placed as a (b) under that, because you, then you refer to 53.220 and .230 -- and that's just one observation -- as opposed to buried in 53.4 somewhere.

And the other point is that, why did you leave out 53.210 for safety criteria for design basis accidents? Are they precluded from being evaluated by PRA?

MR. STUTZKE: Once the licensing basis events have been identified, there's a process within LMP to, then, select the design basis accidents, the classic deterministic set of design basis accidents, again, by use of engineering judgment and this integrated decision-making panel.

Then, once those have been identified, they are analyzed using the traditional conservative techniques. So, it's no longer within the umbrella of the PRA per se.

MEMBER BROWN: Okay. But your first lead-in sentence says requirement to have a probabilistic risk assessment. Right up front --

MR. STUTZKE: Yes.

MEMBER BROWN: -- it sends that message right away. And it just seems, once I get into the safety objectives and stuff, that that ought to be identified as one of the means right off the bat. It's just an observation. We'll go forward; you guys can do what you want. It's just that it seems to me that ought to be -- it goes along with my thought

process that things that are really requirements ought to be identified right up front, not somewhere down the line.

MR. STUTZKE: Yes, point taken on it.

MEMBER BROWN: That's my comment.

MR. STUTZKE: Yes, I'll bring that back to the Part 53 Working Group.

MEMBER REMPE: So, Marty, you had some statements there that -- I'd like to just point out, you said the traditional conservative methods with the deterministic approach. How will one think about what's traditional conservative assumptions for a non-LWR?

And then, again, how do you assure an equal amount of safety in a deterministic approach for a non-LWR, whether it's this new option with 53 versus the old way with 52, which the non-LWR -- or 50 -- the non-LWRs are allowed to go Part 50?

And that's where, again, an example of how this is all going to be connected together I'm struggling with. That's what I was trying to get to at the beginning of my questions today at the beginning of the meeting.

MR. STUTZKE: Right. And my response is, under that way, one would use the same ground rules

that we've used for decades for the large light water reactors. In other words, specifically, for the deterministic type of DBA calculations, one would impose in 102 percent operation reactor power, add 2 sigma to the decay heat curve. All of those classic assumptions, conservatisms, would be imported, then, into the analysis of the DBAs like that.

MEMBER REMPE: So, if you don't have a PRA, and you're going to use the deterministic approach, how do you rule out a hypothetical core disruptive accident for a sodium fast reactor?

MR. STUTZKE: Well, we'll get to that. It's problematic; I understand.

MEMBER REMPE: Okay. Thank you.

MR. STUTZKE: Yes.

Let's get to slide 34.

This is my attempt to try to roll up the review of uses of the PRA in a manner that makes them a little bit more visible.

In the first column -- well, prior to that, the thick horizontal line in the middle of the table, everything above the line is a required use of the PRA and everything below the line is an expected use or a non-required use of the PRA. So, required uses would include: submitting the description of the

PRA and its results; upgrading the PRA like that.

Moving over to the column under Part 50, as I had said, there are no current requirements, but they are being proposed in the Parts 50.52 lessons learned rulemaking like that.

For Part 52 applicants, everybody is required to submit a description, but the COL holders are required to upgrade that PRA. And the required use comes into the TMI requirements, as I've listed there, 50.34(f)(1)(i) like that.

Moving down to the expected uses, again, the search for severe accident vulnerabilities and demonstration of the QHOs are met. Currently, expectations in various Policy Statement, the use of the PRA in design.

When you come over to what we're proposing in Part 53, you would see everybody would be required to submit a description of the PRA and its results, and to upgrade that PRA, but now those expectations have been moved into rule language itself, as indicated by the arrows on the diagram. And that's one of the significant differences between Part 53 and what we currently have in 50 and 52, the codification of uses of the PRA like that.

A little bit further down the page, of

course, applicants are always free to voluntarily use the PRA for a variety of purposes, as they see fit.

One thing that I haven't mentioned too much are the staff leverages PRA information to focus its review; to inform its development of ITAACs, COL action items, the Design Reliability Assurance Program, et cetera, et cetera. We also use the PRA to support our oversight and inspections during construction and operation like that.

So, with that --

CHAIR PETTI: Marty, this is Dave.

MR. STUTZKE: Yes?

CHAIR PETTI: I want to stop there. I love this slide. Thank you.

MR. STUTZKE: Thank you.

CHAIR PETTI: This is the type of stuff that really helps put it in context, because there's lot of moving parts, as your previous slides have showed.

I just had a question, two questions.

This idea of Commission expectations, if you come in under Part 50 and Part 52 and don't meet those expectations, applicants do have to, you know, fix that, right, and deal with it, if the expectations aren't met? Is that true?

MR. STUTZKE: Yes. The burden would be on them to show why they're not doing that.

CHAIR PETTI: Okay. And then, the thing that strikes me, because we've talked a lot about this previously in the language of Part 53, is this evaluation of defense-in-depth. This is a real benefit of the PRA, as a way to systematically look at this. How is that done, if you're coming in it under an advanced reactor and you want to come in under Part 50 or Part 52? Because, still, it's a fairly important safety piece, right? I mean, the staff's going to be looking at that.

MR. STUTZKE: Yes. I mean, if you're coming in under 50 or 52, you know, defense-in-depth philosophy is pretty well embedded in the various prescriptive requirements, such as, throughout the general design criteria or the advanced reactor design criteria, the use of the single failure criteria, and it's like that.

But that doesn't mean the staff will just ignore that. They would also look at the design, let's say, more or less, holistically, and say, gee, there's something missing here.

CHAIR PETTI: So, it's based on engineering judgment and sort of deterministic --

MR. STUTZKE: Right. Yes, it has to be informed by PRA results as well. And certainly, the staff will look at whatever risk information is there.

CHAIR PETTI: Yes.

MEMBER BLEY: Marty, I'd jump in here. I agree with Dave; I think one's very helpful. I think the next few are especially helpful.

I want to go back to what Ron was asking about another issue earlier. You guys have done a great job pulling together a good historical record of how we got here and where you think we're headed right now.

Is there going to be a white paper or some other document that goes with this at some point?

MR. STUTZKE: The short answer is yes. I'll talk in a few more slides about our current plans to develop the guidance to support these various efforts.

MEMBER BLEY: Okay, good. Because this is, for some people, in a way, this is kind of old hat; for others, it's pretty new ideas. And I think it will be important to have that guidance.

MR. STUTZKE: Yes, my comment, Dennis, is, if I didn't have a white paper to write over the holidays, I wouldn't know what to do with myself.

(Laughter.)

MEMBER BLEY: Well, good. I'm glad you have a project.

(Laughter.)

MR. STUTZKE: You know, last year, I was writing the white paper on PRA acceptability about this time.

Anyway, let's move on to slide 35, because this is kind of the summation of this history lesson that I presented throughout this morning.

The observation that you can be risk-informed, either by using a PRA, but also qualitatively like that. I would point out PRA is not currently used to support research and test reactors, so the NPUFs and on-power production utilization facilities. It's not to be found in the SRP for those reactors and NUREG-1537.

And we've discussed it among DANU's staff. Steve Lynch is our kind of management liaison with this Graded PRA Working Group, and Steve is well-versed in RTR licensing and was the Project Manager of the SHINE application for years. So, we have good access that way.

Integrated Safety Analysis, ISAs are required for certain licensees under Part 70. It's a

risk-informed process, but doesn't require the development of a PRA. And I've been in close contact with Donnie Harrison over in NMSS about how they do this. And as you'll see, I think there's a lot of information they've developed that we should be able to leverage like that.

And last, and not least, as I've showed you on the previous table, the current preliminary rule text for Part 53 builds on the traditional role of PRA. It would put that into regulation, and it adds certain requirements to use PRA in the enhanced role.

So, rolling that up, it implies three possible licensing pathways, what we'll call the enhanced approach; the traditional PRA approach, and then, a new approach, the technology-inclusive, risk-informed maximum accident, or TIRIMA, approach. And I'll try to delineate those in the next slide here.

Let's go to slide 36, please.

So, this is a flowchart. I'd, again, emphasize it is work-in-progress, as we try to think through this. But, in boxes A and B are the comprehensive search for initiators and definition of event sequences. As Dennis had pointed out, those are common to all the approaches. They're just absolutely

essential like this.

Entering box C on the diagram, there would be entry conditions that say, well, maybe you could use this TIRIMA approach or an applicant would elect to, hey, I just want to do a PRA; in other words, determining on which licensing pathway they're in.

Well, let's assume that they're going down the PRA path. So, they would proceed from box C to box K, and then, they would decide, do they want to use enhanced PRA, yes or no? If yes, they go to box L. If not, they could go to box M.

So, an example of the enhanced PRA approach could be Part 53, or it could be an applicant that comes in under Part 50 or 52, but they want to implement LMP, something like that.

Otherwise, box M is representative of situations where an applicant comes in under Part 52. They want to do the normal PRA, but nothing beyond that. So, it's like we always done for combined licenses and design certifications, things like that.

But, returning to box C on this figure, we're thinking very hard about considerations and scoping assessments that would provide decision guidance to applicants to decide if they want to proceed down the TIRIMA pathway.

But let's assume they decide to do that. Then, boxes D, E, and F, the blue boxes, those are steps out of NUREG-1537, which is the Standard Review Plan for research and test reactors. So, there's a process of selecting licensing basis events, doing the consequence analysis, and culminating in an identification of the maximum accident, which could either be a maximum credible accident or a maximum hypothetical accident, the difference being that the MHA is not necessarily physically real.

MEMBER BLEY: So, for the people who have been arguing at least for some of the smaller new designs, we ought to be applying the research and test reactor kind of approach. That's built in here in D, E, and F?

MR. STUTZKE: Yes. One of the guiding premises behind the development of this TIRIMA approach was we should be able to license small power reactors similar to the way we currently license research and test reactors. That was kind of the guiding premise going into the process.

MEMBER BLEY: Let me just think about this a little out loud. If I were coming in with a new reactor, and I thought, gee, we're probably bounded by our consequences and don't need to do much, I could

take approach here, the TIRIMA approach, and if it turns out well, everything's good. If not, I can go back up and do something more thorough?

MR. STUTZKE: Correct. And that's the purpose of the feedback loops coming out of boxes H and I. So, the idea is that you would come down and realize, whenever you license a research and test reactor, there's not just the maximum accident, whether it's an MCA or MHA. You're obliged by that Standard Review Plan to look at a set of design basis accidents, and from that, you pick the maximum one like that.

But the idea here is, if I don't want to do a PRA, can I use the source term from the maximum accident to get an indication of what the risk ought to be? So, I would insert that into some tool, such as MAACS, and generate the conditional risk. And then, I would say, well, I don't really know the frequency of the accident, but, clearly, it's going to be much lower than once per year, which is the normal reactor trip frequency for LWRs. So, that would seem to be reasonable.

And then, I'd demonstrate, I should be able to demonstrate that I'd meet the QA chose. I have done --

MEMBER BLEY: But you can't just make up a really simple maximum accident. You have to do A and B to make sure you've thought of the things that could lead to that maximum accident.

MR. STUTZKE: Oh, absolutely. And so, what we are in the process of developing, you'll see in the next couple of slides, is guidance on how to do each one of these boxes. So, A and B, then you would end with the set of initiators and event sequences, and you begin, what we'll call, a funneling or a winnowing process to get it down into a set of licensing basis events that have similar characteristics.

MEMBER BLEY: Hey, Marty?

MR. STUTZKE: Yes?

MEMBER BLEY: You mentioned that you have Bob Budnitz on your team helping look at this. Have you had interactions with potential applicants about this? Or is this going to be all new to them today?

MR. STUTZKE: We have talked about this at the November advanced reactor stakeholders' meeting. But we've not had any subsequent interactions since that time --

MEMBER BLEY: Okay.

MR. STUTZKE: -- about how this would

actually work.

MEMBER BLEY: And you haven't had any hints of one of the outside organizations working on guidance themselves and bringing it to you?

MR. STUTZKE: There was some discussion by NEI that, you know, maybe they should develop guidance that we could help them endorse. Our current plan is to roll all this up into a white paper, let's say, by the end of January to try to lay out the process and the high-level thinking like that.

MEMBER BLEY: That's great, and I really look forward to seeing that.

Go ahead.

MR. STUTZKE: Yes.

MEMBER REMPE: So, this is Joy.

And I think really helps. It answers the question about they've got to look at a bunch of challenges.

And then, I think you've answered my question about the maximum or the core disruptive accident. Because probably they would exceed the QHOs and they would have to go back and do a PRA and show that the frequency is low, is the answer to the question, right?

MR. STUTZKE: Yes.

MEMBER REMPE: Cool. Thank you.

MR. STUTZKE: I was going to say, I've done a back-of-the-envelope calculation. I mean, this is literally fiddling with equations on a piece of paper, not computer simulation. That would suggest, if you could meet the EPA PAGs with the maximum accident -- so, that would imply there would be no need to evacuate or to relocate population, which gives me an idea of the dose -- and the exclusionary radius was smaller than about 90 meters, you would be able to demonstrate you had met the QHO.

MEMBER HALNON: Yes, Marty, this is Greg.

That kind of answered one of my questions. We just went through the rulemaking on 5.160 for EP. I assume that -- at least I'm keeping it in mind -- are they kind of monitoring what you're doing here to help maybe answer some of the questions and comments out of that rulemaking aspect?

MR. STUTZKE: Not yet, and it goes back to the earlier concerns about getting coordinated among all of these rulemakings. I appreciate that.

MEMBER HALNON: Yes, I think it's kind of answering some questions. It may not be the final answer, but it certainly is addressing some of the issues.

MR. STUTZKE: That's nice to hear. We're trying to ask the right questions.

But, yes, so where we are now, moving over to slide 37 --

CHAIR PETTI: Marty, just go back for a minute.

MR. STUTZKE: Yes.

CHAIR PETTI: Just so I'm clear, so this conservative risk estimate, you know, one takes the doses, like you say, let's say the design can meet the PAGs at a really tight site boundary. And they can be somewhat -- well, cavalier is not the right word -- but generous in terms of frequency estimates because the doses could be so far away from the regulatory requirements. And just doing that sort of simple math, there's a way to conservatively compare yourself to QHOs?

MR. STUTZKE: Yes, with the caveat that they need to -- or if they come in with an argument that says, well, clearly, the maximum accident has a frequency of 10 to the minus 2, I view that as they need to justify that. Why 10 to the minus 2, or 10 to the minus 3, or whatever? And that puts you back into the PRA space.

I would be willing to accept once per year

because that's the historical reactor trip frequency for large LWRs. But anything that needs a tighter frequency, you know, or a smaller frequency, in order to lower that conservative risk estimate, you begin to creep into the PRA space, which, then, leads me to question, well, you ought to be inside the standard and using all, meeting all the requirements like that.

So, the idea, again, behind box G is merely to take the MHA or the MCA source term and stick it in the MAACS, and look at the conditional consequence. And if it's small enough, then you should be allowed to proceed down the TIRIMA pathway. Otherwise, you're going to have to develop the PRA.

And the purpose of the callout box, the box C, is to generate some sort of guidance that applicants could use to decide before they go down this pathway, and they are surprised late in the design process, oh, you know, I need a PRA, to be aware of that up front.

CHAIR PETTI: Okay.

MEMBER DIMITRIJEVIC: Marty, this is Vesna.

I could actually really struggle with this better, you know, using any likelihood number constitutes PRA. I mean, you know, a lot of

initiators are not coming from PRAs. You know, the earthquakes, the tsunamis, you know, those frequencies. So, if you have an accident that you can have these large releases that you are concerned about only if you, for example, get hit by metal, you know, that's not a PRA. That's a very low likelihood of events, coming from the statistical, the events. Or if you have a tsunami of 16-feet high.

So, I mean, my personal feeling is that this part of the -- that's not really necessary that it just has to be based on consequences. It can also be based on likelihood, if you can show in the box A and B that leading to those large releases, you need some very unlikely combination of events. Obviously, you don't need the PRA to prove that, you know.

MR. STUTZKE: Right. Yes, I understand where you're coming from, and it's an active discussion within our Working Group, not just to demonstrate compliance with the QHOs, but look at box I; do you need the PRA to do the SAMDA analysis? And that's where we're finding we need to credit lower frequency of the maximum accident, other than just assuming once per year.

In other words, the idea of the premise was, what would happen if the maximum hypothetical

accident occurred on every reactor trip? Would that still be okay? And the answer is, well, if the reactor is small enough, the consequences would be very minimal, and you would be able to demonstrate you meet the QHOs.

But I'll speak a little bit more about box I and what we're doing in that area.

MEMBER DIMITRIJEVIC: And one of the things I was interested to see how would we do the EENF (phonetic), you know, without the PRA inputs. We have in here so many things which are very complex because they're sort of a chicken-and-egg problem.

MR. STUTZKE: Right.

MEMBER DIMITRIJEVIC: You know, you need the licensing basis events to develop -- I mean, there is so many things.

But you referenced that NUREG for the test reactors, right, for that demonstration, how would this, the blue boxes, be performed, right?

MR. STUTZKE: Yes, I will speak to that in a couple of slides here.

MEMBER DIMITRIJEVIC: All right.

MR. STUTZKE: Let's go to slide 37.

CHAIR PETTI: So, Marty, just one more quick question on this white paper.

MR. STUTZKE: Yes, sir.

CHAIR PETTI: I'm sure we want to write a letter on this topic. I'm just trying to figure out, would the white paper and our review of that white paper, would it be the right time, you know, to come back to us, so we can get a letter to you on that topic, on this topic?

MR. STUTZKE: Yes, I think that would be useful.

CHAIR PETTI: Okay. Just another on the list.

(Laughter.)

MR. STUTZKE: Yes, let's move to slide 37, please.

So, we're considering how to develop, what we'll call, how to guidance to implement this approach. And basically, all of the boxes on the flowchart would have some sort of guidance developed for it. To the extent possible, we would hope to leverage existing guidance.

And I've listed some things there: the ISA, Integrated Safety Assessment guidance document, and 15.13, the SRP for fuel cycles, and 15.20, which has very good guidance on process hazard assessment. And it actually uses risk matrices of qualitative ways

of getting at the risk triplet. 15.37, the guidance for research and test reactors. Another valuable source would be OSHA regulations, 29 CFR 1910. There is a whole set of handbooks and guidance on how to do process hazard analysis, things like that.

I've listed this EPRI Topical Report, Technical Report -- excuse me -- that they developed. This one was developed by Vanderbilt University, and it implements process hazard assessment for the molten salt reactor experiment, as kind of beginning steps of doing a PRA. It's part of their LMP pilot exercise like that.

But the type of guidance that I'm envisioning for this, for example, boxes A and B, there are a number of techniques, and I'll try to review them in the next slide. But we're not writing a textbook on how to do this. Rather, we would provide guidance that would contain pointers to various references and authorities that could be used, things like that.

Concerning box D and E, and primarily, box D, the licensing basis event selection, let's assume you don't have a PRA. What do you do? Well, we've looked at the SRP for commercial reactors, NUREG-0800, and the SRP for RTRs in 1537. And it is, in my

personal opinion, a little less than satisfying. They talk about grouping accidents by their frequency and by their type, you know, such as increase in heat removal, decrease in heat removal, broad categories.

So, some high-level concepts there, and then, they present the answer. For PWRs, this is the list of licensing basis events. For BWRs, this is the list. For certain types of RTRs, this is the list. And it's as if the staff had gone through that exercise and made that conclusion.

What we're trying to do here is, they're recognizing that we need to address all types of non-LWRs. We're trying to put that burden onto the applicant and provide appropriate high-level guidance on how to do that, but more definitive than what you will find currently in any of the existing SRPs. So, it's a real challenge. It's a real challenge.

Slide 38.

A second thought on developing guidance. In general, thoughts that we had had was this admonition to start with a blank piece of paper, no preconceived lists of design basis accidents or scenarios, anything like that.

We're currently thinking you need to use a combination of inductive and deductive methods. In

fact, process hazard analysis is a collection of methods such as HAZOP and failure modes and effects analysis, things like that. On the deductive side, things like master logic diagrams, you know, sequence diagrams, fault trees, event trees, all of that.

And again, that's why our guidance, right now, I'm envisioning it as some high-level things with pointers to various references, rather than this kind of comprehensive textbook on how to do it.

The third sub-bullet there, when you search, how do you know you've done enough looking? How do you know you're finished? And there ought to be some sort of stopping criteria.

What I have in mind is, there is a very old paper that was written by a guy named Clifford Beck back in the late '50s, and he talked about identifying design basis accidents by postulating or initiator and one or two subsequent failures. And his conclusion was that doesn't really work very well because you don't know that the failures are truly independent of each other.

But it goes back to the original idea, gee, if I can just add, you know, if I'm looking at cut sets with single events, your double events, your triple events, maybe that's some way to get your arms

around the problem.

The fourth bullet is the old admonition: focus on how it actually works, not how it's supposed to work. In other words, don't say oh, that's incredible, that will never happen, because it probably will.

Guidance on how to consolidate and group similar items. What does it mean they have similar characteristics?

And again, admonition, be very careful when screening something out with the frequency arguments or some sort of qualitative things.

MEMBER BLEY: Hey, Marty?

MR. STUTZKE: Yes?

MEMBER BLEY: This sounds so trivial, it doesn't seem like it's worthwhile, but I assure it is. If you put on there try to break the system, think how I could sabotage or break this system, what would I need to do, that flip of approaching the problem can often find you things that you hadn't thought about.

MR. STUTZKE: Oh, absolutely.

MEMBER HALNON: So, Marty, this is Greg.

That last bullet there under initial thoughts, I think, isn't that the -- I mean, we're all pretty good at knowing how the plant works and how

design actually works, and all that grouping of items. But that screening criteria is where the industry is really driving for some kind of criteria, so that it's not just everything is considered and nothing is screened out discussion. So, I would just be very focused on that screening criteria because I think that's really the hitch pin in all this stuff.

MR. STUTZKE: Yes, I personally appreciate that. I mean, I've got a pretty good history on the definition of credible accidents that goes way back to the '50s, but it is problematic when you begin screen things away on frequency, and that frequency to say appropriately or carefully estimated. So, it's an open item, and I appreciate the sensitivity to that.

MEMBER HALNON: Yes, we went through that with the 50.160, on what is a cutoff and what kind of frequencies are we looking at. So, that was very keen on the designer's list of concerns about how to get to that source term and site boundaries.

MR. STUTZKE: Yes. Yes. Yes, I'm well aware of it, but I can't offer you an answer right now.

So, our guidance would, also, then, have to address these process-related things. You know, we need to have a multidisciplinary team looking at the

issue, what we'll call an independent review, as opposed to a peer review, and a peer review in the context of the standard; get some fresh eyes looking on it like that. The development of documentation, again, that's not just -- we want to know or think it's important to capture how you get to the final answer. But I'm characterizing that as tell the story in capturing the assumptions and the various decisions that were made along the way, rather than as a fait accompli, here's my list of design basis events.

So, slide 39.

This is a preliminary flowchart we've worked out on the initiating event scenario search like this, where we would identify initiating events using well-established inductive and deductive methods. As I've mentioned before, the use of HAZOP, FMEA, master logic diagram, fault tree analysis, human-induced events. You know, there's certainly well-established human reliability analysis techniques that could be used to go after that. Bouncing them against operating experience to look for gaps or anything that you may have missed, and then, begin winnowing it down to a final set of initiating events. Then, on to a scenario delineation and categorization sort of process like that.

MEMBER BLEY: Hey, Marty?

MR. STUTZKE: Yes?

MEMBER BLEY: Your step two, verification against operating experience, that also includes looking at the list of initiating events that were developed for other reactor technologies?

MR. STUTZKE: Yes.

MEMBER BLEY: Okay.

MR. STUTZKE: But the crucial step is we want you to do step one with a blank piece of paper, and then, use step two to see that you got there. You know, you didn't miss anything.

MEMBER BLEY: Okay. I like that, and some others I think do, too.

MR. STUTZKE: Yes, don't reverse the steps, even though it's hard, you know, if they were to hire like you, Dennis or me, I mean, we already know step two. But you have to try to approach it with an open mind. As you say --

MEMBER BLEY: Right.

MR. STUTZKE: -- how can I break this thing?

So, slide 40, please.

So, this is our preliminary outline for how to go after the comprehensive search for

initiating events just as an outline. We're starting to write text, to begin to fill out each one of these points like that, with the caveat this may not work, but we may shuffle the outline around a little bit. We're trying to show you the comprehensive nature of what we're looking at here.

Slide 41.

MEMBER BALLINGER: This is Ron. Can we go back to that one slide? Back one?

MR. STUTZKE: Yes, please.

MEMBER BALLINGER: What I don't see here is a section on the events that were not included. I recently participated in a review, and anybody that wanted to delete something, an event or a process or a failure mode, had to sit there and defend why you needed to eliminate that event.

So, it would be curious to have people go through the events that are, obviously, not stupid, I guess, but the events that were not considered and why.

MR. STUTZKE: I like that. That's good. I appreciate that.

MEMBER BALLINGER: It's just the mere discussion of that sometimes makes a big difference.

MR. STUTZKE: Okay, I've got a note.

Thank you.

MEMBER BALLINGER: Okay.

MR. STUTZKE: Okay. Slide 41, where we're headed and the path forward.

We need to develop a way to incorporate this TIRIMA approach into regulation, so that it could be used. And the current thought is it could, for lack of a better term, piggyback onto the deterministic traditional option that was presented to you all earlier, what we call Tip 50 or Part 5X. And that is the more technology-inclusive Part 50 that would allow use of, for example, IAEA SSR 2/1, like that.

But what I have in mind is something as simple as saying, instead of a requirement to develop a PRA, then have a requirement to develop a risk assessment. And that may sufficient to open the door. Again, we have not written any preliminary rule text or agreed upon, actually, how to go about that.

The other thing that that points to is, where will Tip 50 ultimately end up in regulation? Should it be under Part 50? Should it be in Part 53, et cetera, et cetera? And these are very complicated, technical issues; in other words, how we structure the rule language to allow them. There are also very

complicated budget and schedule constraints that we're laboring under like that. So, that decision will be made in the near future, to my understanding, like that.

The second bullet is pointing out an order, actively developing the guidance to try to implement this approach, and as I pointed out before, lever whatever existing guidance we can find out there.

And one thing I should amplify: it's not just a matter of listing, gee, the fault tree handbook, but we need to look at all of these things and say, gee, is it still relevant; is it still useful? Or do we not want to recommend it like that?

I had showed you the outline of the guidance on how to search for the initiators, and we need to develop for the rest of the entire guidance document.

But there are three very challenging technical issues that are still floating around there.

One is the technology-inclusive definition of severe accident, and about working --

MEMBER BLEY: But -- oh, I'm sorry.

MR. STUTZKE: Yes, I'm working with Bob Budnitz on how to do that.

MEMBER BLEY: Your large release frequencies seem a good place to start. I don't know if that's where you are or if you're somewhere else.

MR. STUTZKE: Yes, we're somewhere else. It's real curious, and one thing I'm glad you reminded me, Dennis, was, do you recall back -- or you may recall back in the early 1970s there was a tremendous concern with anticipated transients without SCRAM.

MEMBER BLEY: Absolutely, yes.

MR. STUTZKE: And the staff wrote, at the time this AEC staff, the Atomic Energy Commission staff, wrote WASH-1240 on ways to deal with that ATWS problem. And if you go in there, you'll find out they had proposed that the frequency of exceeding the Part 100 limits should be less than 10 to the minus 6 per year, coincidentally, the large release frequency target that we currently use. So, that's in there, that we're going with the definition of severe accidents is you need to replace severe damage to the core with something like severe damage to the machine, broaden that out a little bit.

Another possibility that we uncovered recently was from the UK regulator, where they talk about the unplanned movement of radioactive material. So, the idea that it's penetrating a barrier or

multiple barrier and getting out into the environment. And we'll have to have a good look at that one like that.

MEMBER BLEY: Yes, this building it on barriers kind of gets to your other one about severe damage to the machine. If your barriers are all intact, maybe you're okay. But if you've penetrated some of them, you're more vulnerable. That seems a good place to be working.

MR. STUTZKE: Yes.

CHAIR PETTI: And that's the primary safety function, right, in Part 53?

MR. STUTZKE: Yes.

CHAIR PETTI: So, looking at it that way --

MR. STUTZKE: The problem is when you get barriers and you mix it up with the idea of functional containment. We're not clear yet on our thinking about how that would all work like that.

MEMBER KIRCHNER: Well, in that case, though, Marty, like you mentioned the HTGR. I mean, the current definition probably works, because that would be severe core damage, if you had large-scale release of fission products on the TRISO particles. That, effectively, is core damage.

But I think what Dennis said is probably -- you know, it's a combination of that and the fission product barriers, especially for a liquid-fueled system.

MR. STUTZKE: That's problematic. Molten salt reactors.

MEMBER KIRCHNER: Yes.

MR. STUTZKE: Yes.

So, the second sub-bullet there, again, I had mentioned it before with that callout box to step C on my figure, what we'll call guidance to applicants to help them decide up front if TIRIMA will ever be useful to them, or they should start right away developing their PRA like that.

The third item on use of TIRIMA to support SAMDA. The current way that we do SAMDA -- so, that's severe accident mitigation design alternatives -- this is part of the environmental review, not the safety review, of the reactor. And SAMDA analyses are done using cost-benefit studies. So, they tend to follow the regulatory analysis guidance in NUREG/BR-0058, which is a process where you go through various alternatives and you, basically, monetize the risk-benefit achieved, and then, compare that to the price or the cost of implementing that type of a fix.

There's also NEI 05-01 that provides the process.

The challenge is, whenever you look at how SAMDA is done, it implies you need a full Level 3 PRA. So, in other words, you would have all of your event sequences delineated with frequencies on them. You would, then, have consequence evaluations using MAACS, or something like this.

And your goal is to calculate conditional risks, such as the population dose, person-rem per event or offsite economic consequences, monetized dollars. So, for property damage, the cost of evacuation/relocation. Monetization of the onsite worker risk, and things like replacement or cleanup of the facility; replacement power costs, et cetera, et cetera.

So, that whole framework exists, and that's all well and good. But if you're trying to do something like this TIRIMA approach, where you don't have the benefit of all of the sequences of a PRA, and all of the consequences, the question that arises is, can you use the MHA or the MCA to bound it somehow and make an argument that says up front we don't think anything will ever prove to be cost-beneficial. So we've been struggling with that for the last couple of weeks. And I just wanted to tell you that's where we

stand right now.

So, I believe that concludes all of my viewgraphs.

CHAIR PETTI: Okay. Thanks, Marty.

I want to say that this has been a really informative set of slides. I'd just say the fog is lifting, at least in my brain, on some of the intersections of things and how some of the pieces fit together.

Yes, you've still got some guidance that has to be developed, but I like the structure; I like the logic behind it. So, we'll look forward to the white paper for sure.

Members, any other comments?

MEMBER DIMITRIJEVIC: Well, this is Vesna.

Me, too. Actually, I think that this is a big step really forward. I didn't like how the structures were getting along together. And now, Marty, that you consider the regulation requires risk assessment, that is, the PRA assessment, I think that's a wonderful step. That's exactly what I think you should be required.

I had a really strong opinion from the beginning. And I think that this would be better if the QHO are bounded. You know, they have been

introduced in the '80s, when we know very little. You know, the PRAs were not really developed yet. There was not too much experience in the industry.

And I thought of Virginia, since they're trying to say we're going to build industry, which is not going to present a high edition of this interpolation. But now, this is like, you know, the forty years, fifty years later. We have R&D. We have experience with numerous PRAs. We saw how these risk measures are coming, and what value.

We had the accidents. We have multiple core damages. It depends on how you count Fukushima. We had three big accidents. We can see in those accidents that one of those accidents, Three Mile Island, was without large release. And we can see from that accident the connecting core damage frequency. It's really a dubious proposition.

The second thing we also saw, the large releases, and what is in the dose is like conditional probability, giving these large releases of fatalities. Early fatalities is also, you know, a questionable proposition.

So, I think, given the experience with the PRAs -- no, first, given the experience in the industry, and given the experience with the PRAs, we

can say goodbye to clear goals in this moment, and based on the dose experience proposed, the safety goal is some sort of release. And what release is it? Is it in dose? And what it is with associated frequency or with the 10 to the minus 6?

So, we can say we want the new generation of the nuclear plants to represent less risk than the coolant or equal. I know that there is a lot of discussion of they should be equal or smaller.

So, therefore, I think that, actually, being brave enough to come up with some new safety measures for the new generation will make this, you know, all of these pieces easier falling in the place. This is just my opinion.

MR. STUTZKE: Yes, I appreciate that. And I'll quip, I don't think I can do that and meet Bob Beall's schedule.

MEMBER DIMITRIJEVIC: In my opinion, if you have, like you're saying that releases of this magnitude, then how's he going to define these magnitude, this challenge? But the releases of this magnitude should be less than 10 to the minus 6 or 10 to the minus 7, or whatever. And the frequency is also something to be decided. That is much easier to determine how to choose that, how to prove the plan to

meet that safety goal without always the PRA, I mean, instead of saying we are meeting that QHO, you know.

You know, we have so many of these discussions, and now, everybody knows what is QHO. So, you can go back to the PRA practitioners, and now that they really know what this core damage frequency, the large releases were based on this. So, if you define some large release and use that as a safety measure, it makes things much simpler and much less complex.

MR. STUTZKE: Yes. Thank you.

Any other question?

CHAIR PETTI: Yes, other comments, Members?

Wow. Okay.

So, Derek, do you want to wait until the very end of today to do public comment or public comment for a session?

MEMBER DIMITRIJEVIC: And Dave? Dave?

CHAIR PETTI: Yes?

MEMBER DIMITRIJEVIC: Sorry, I just forget to mention something, which I was also curious. There was a lot of questions, I think like 14 questions were imposed for public comments in the last year. And there was a number of public comments. So, was

wondering, the Working Group took a position on some of those questions in this moment, actually? Or are those still in consideration? Are they still floating around?

Like, for example, on the score for the QA or there is numerous points of those questions. I was just curious to ask, did the Working Group, on 53, that accepted some of the responses in this moment, or this is still in floatation?

MR. STUTZKE: It's still under consideration. We haven't made any firm decisions yet.

MEMBER DIMITRIJEVIC: Okay. Thanks.

MR. WIDMAYER: Hey, Dave, it's Derek.

I think you could take advantage of the time right now to get public comments just on this particular part of the meeting.

CHAIR PETTI: Okay. I see Vicki's unmuted. Vicki, did you have a comment?

MEMBER BIER: No. Sorry, I just forgot.

CHAIR PETTI: Okay. Okay.

Okay. So, let's see if there's any members of the public that want to make a comment on what we've heard this morning. *6 to unmute your line. Tell us who you are and your comment.

MR. BUDNITZ: This is Bob Budnitz. Can I make a comment? Can you hear me?

CHAIR PETTI: Yes. Sure, Bob.

MR. BUDNITZ: Now, Marty pointed out that I've been a consultant to his small staff Working Group on this TIRIMA approach and the graded PRA. But my comment is not related to that. This is I'm a member of the public. Okay? I just want to make that disclaimer.

The very first box in Marty's box slide -- and you don't have to go back to it because we all understand it -- it begins by asking the designer to do a comprehensive, complete search to identify all of the initiating events. You understand that. And that's for sure; you've got to do that. You can't get into the rest of it without that.

And that search is something that the designer has to do, especially if it's a reactor whose design is not something that the whole community is familiar with, I mean, as opposed to LWRs, you know, some new design. They have to do that.

And I'm worried about how comprehensive that can be and how much review it will get, both by other members of the larger nuclear engineering community -- we're talking about around the world --

and then, the staff.

And I have a piece of history that will explain my worry. I want you to imagine it's 1975 and Rasmussen and Levine, and their colleagues, published WASH-1400. And in WASH-1400, they identified an event which people had known about, but which had been dismissed. It was the interfacing systems LOCA. We called it Event V, interfacing systems LOCA.

And I want to remind you of something. When WASH-1400 was published, there were a couple of hundred reactors, water reactors, running around the world, operating in many different countries, and we had 50 or 60 of them in the U.S. And all of them had been running for a long time at that time, 20 years, with a lot of experience. And no one had paid attention to interfacing systems LOCA in the way we now understand it needed to be attended to.

So, I want to ask the question, going back, how in the world did the whole community all around the world get into 200 reactors, whatever it was that was running, and a bunch of years, and the importance of that event -- they knew about it, but they dismissed it -- had not been recognized?

Now that's a humbling experience. Because now we take one of these new reactors from one of

these unusual designs, and somebody might have run one month someplace, and no one's really designed them and run them for any length of time. How are we going to get the confidence that all of those things have been identified that are going to be important?

It seems to me that that's a major -- I'm talking now as a member of public, not as a young consultant to the staff -- it seems to me that a major challenge that we, the nuclear engineering community, the power reactor community around the world, has is to ask ourselves how that confidence can be gained.

And the stuff that I was hearing in the plans today, and not just here -- I've heard them from the industry, too -- don't give me confidence that there will be enough outside review, enough comprehensive looking, enough imaginative work done, to give people confidence that we've identified those things. That troubles me.

And this whole process, the whole Part 53 process, not just this piece, is predicated on the confidence that the analog of Event V, the neutral thing, will have been identified and its importance understood.

Now, of course, Event V was identified during a PRA. Well, okay, but what if you don't do

one? I'll just leave you with that thought.

MEMBER BLEY: You brought up something really interesting, Bob. I think one thing is, if we look at the earliest designs and the reviews that went on then, we have a lot more structured approach and thinking about how things can go wrong than we really had back then.

On the other hand, this idea of getting broad international review for different types of reactors on the things that can go wrong is -- it's one I'm not sure anybody has been thinking hard about. You know, there's no conferences on what can go wrong in all these new designs that I've seen, and maybe that's something we all ought to think about.

CHAIR PETTI: Good discussion.

Anybody else?

Okay. Well, then, I think we'll end this part of our Part 53 discussion 10 minutes early. We'll have lunch.

So, let's see, we'll come back at --

MEMBER BLEY: Dave, did you check and see if you had any more public comments? Bob came in and --

CHAIR PETTI: Yes, I thought I did.

Does anybody have any more? Are there any

more comments?

MEMBER BLEY: Sorry to interrupt you. Go ahead.

CHAIR PETTI: Okay. Not hearing any, we'll come back to some of this, I think, when we hear NEI's comments and USNIC's comments tomorrow afternoon.

So, with that, let's go into recess and come back at two o'clock Eastern time.

Thank you all.

(Whereupon, the above-entitled matter went off the record at 12:50 p.m. and resumed at 2:00 p.m.)

CHAIR PETTI: Welcome back, everybody, from lunch. We're ready to resume the meeting.

Bill, are you taking over?

MR. RECKLEY: Yes, thanks, Dave.

CHAIR PETTI: Okay.

MR. RECKLEY: This is Bill Reckley. I just have a few slides and then I'll turn it over to Jesse Seymour to talk about the bulk of what we're going to talk about today.

So, Liz, if you can go to 45.

Basically I was just going to refresh people's memories on the broader requirements that we included in Subpart F. And going back to our standard

slide that Bob shared this morning, we have organized Part 53 into sub parts that generally align with the life cycle of the facility. In Subpart F are the requirements for operations.

And so the general layout of Subpart F is into three primary segments. And I think I mentioned last time the way I think about it is plant, people, and programs. And so the plant is those things like maintaining the capabilities and the availability of structures, systems, and components, and this includes technical specifications for safety-related equipment, reliability assurance programs for non-safety-related equipment that warrants special treatment. The equivalent of the maintenance rule from Part 50 would be in that part associated with the plant.

Then the second segment that we're going to talk -- that we talked about at the last Subcommittee meeting; we're going to continue that discussion today, is on staffing and training.

And then the third segment of the requirements for operations goes to programs, and those are the things that -- actually if we just go to the next slide, slide 46 -- are necessary to make sure that the equipment and people are supported by the broader organization and procedures and so forth

associated with key areas such as radiation protection, emergency preparedness, security, those things that are typically addressed by major programs associated with an operating facility.

So that's kind of really all I wanted to go over as a refresher before turning it over to Jesse on the next slide which will start really a continuation of the discussion that we had at the last Subcommittee meeting.

So, Jesse?

MR. SEYMOUR: Okay. Thank you.

Yes, so my name is Jesse Seymour. And just a quick background: I'm a human factors technical reviewer and operator licensing examiner in the NRC's Office of Nuclear Reactor Regulation. And as I mentioned during the last meeting, I'm one of the staff members who has been working on developing the preliminary proposed rule language that we discussed at the earlier meeting, as well as the related white paper that preceded that.

And today's presentation will be a continuation of my earlier one given last month on that preliminary proposed rule language, specifically the language that covered their staff and training personnel qualifications and human factors engineering

requirements. But the particular focus today will be on topics that were provided by the Committee for further discussion.

Since these topics build upon aspects of the preliminary rule language that was presented last month, what I'd like to do is begin the discussion of each topic with a very brief recap of what the preliminary rule language presently contains within that area simply as a means of establishing context and bridging the discussion to our earlier one. And then following that short recap I'll provide material is that is specific to the Committee's questions within those areas.

I'll be going over the topics in the order that's show on the slides, so we'll begin with the shift technical advisor discussion area followed by load following then certified operator considerations, simulators and lastly training program review guidance.

If we could go to the next slide, please? Okay. So I'll begin the discussion of the shift technical advisor topic with a short recap of the preliminary requirements for staffing plans. And as I discussed during the last meeting, 53.753(f) would require a staffing plan describing the numbers and

positions of licensed or certified operators. Facilities requiring licensed operators, owing to the greater operator role in safety at such facilities, would also need to describe how the proposed staffing would provide assurance that plant safety functions can be maintained using human factors engineering analyses and assessments.

So over the next few slides what I'll be discussing are a few different potential approaches to STAs out of Part 53, but the requirements that I'm discussing here at the moment will factor centrally into each one of those different approaches.

The Committee asked for an explanation on the benefit of having a blanket elimination of the STA under Part 5 versus having a licensee demonstrate that STA functions are instead adequately addressed. At a high level what we've considered are multiple approaches in this area and at present we feel that more than one option is technically justifiable while all of the options do afford enhanced flexibility over the current status quo.

And just to take a step back and be frank, I think that -- I think we can make a case as to why the STA may be unnecessary within a certain context, but I think even when we do that we still have a

remaining question regarding whether elimination is prudent. And I think there is a distinction there. And I think that it's an offshoot of the consequence of the nature of this relatively unique advisory role and I think more than anything else it serves to highlight what ultimately the treatment of the STA under Part 53 will entail matters of policy.

So I'd like to emphasize that we as the staff are receptive to feedback from this Committee regarding the best approach to take with this rulemaking and we value the Committee's expertise. So in light of that I'd like to go through and describe three separate approaches beginning with what is currently included within the preliminary rule language.

If we can move onto the next slide, please? Okay. So as discussed previously the staff had preliminarily proposed not to require the STA position for Part 53 applicants. In arriving at this preliminary stance our thinking was partly informed by the Commission's 1985 policy statement on engineering expertise on shift which stated that the STA requirement was an interim measure until goals and included upgrading HSIs and operator training were achieved.

In considering the state of those goals within the context of Part 53 there were several key attributes of the preliminary rule that served to shape our thinking regarding why a blanket elimination of the STA would be justified within this Part 53 framework. And on the next slide I'll go ahead and provide an overview of what those points were.

If we can move onto the next slide, please? Okay. So and again we're talking about this first alternative of a blanket elimination of the STA, and this slide will go through some of that background information regarding that point.

So first, Part 53 would establish licensed operator training requirements or the operator knowledge and abilities needed to maintain plant safety functions. Building upon that regulatory basis we intend that the Part 53 Examination Program would have review criteria associated with it that would confirm that testing of reactor theory, thermodynamics, systems, and emergency operations were required within the scope of licensing processes.

Second, Part 53 would require that state-of-the-art and human factors engineering would be applied in all settings where operators are fulfilling plant safety functions including both inside and

beyond control rooms. Additionally, specific design requirements for human system interfaces would require that operators be provided with information on safety parameters, safety system status, important component status, and core damage states.

Third, proposed staffing plans for facilities with licensed operators would need to be supported with HFE-based analyses and assessments that were sufficient to demonstrate how licensed operator staffing levels would maintain safety functions and support full range of tasks needed for safety irrespective of the presence of an STA within the staffing model.

And finally more broadly speaking with regards to Part 53, Part 53 codifies defense-in-depth principles under 53.250 and requires in part that the use of defense-in-depth compensate for uncertainties in both the state of knowledge and modeling capabilities as well as in areas of personal reliability and performance. In this regard we can consider that having an STA within a staffing model could potentially be one such defense-in-depth measure, but there would be others and ultimately Part 53 would mandate that some degree of acceptable measures be applied.

If we could move onto the next slide, please? Okay. So in this slide we present an alternative. And so setting aside our discussion that we just had which illustrated one approach for blanket elimination, now what we're going to look at would be a case-by-case treatment.

So now as an alternative to a blanket elimination of the STA under Part 53 we've also considered the alternative of codification of an STA staffing requirement with a provision for justifying case-by-case position omission built into the rule. In such an approach the following definition or one similar to it would be provided within 53.750(b), which is a section where we currently have definitions that are very specific to Subpart F.

And the definition that we propose would read along the lines of shift technical advisor means an individual possessing at least a bachelor in physical science engineering or engineering technology, or alternately a PE license, whose function is to provide independent on-shift engineering expertise and accident assessment technical advice for licensed operators in nuclear plants.

In conjunction with this the

aforementioned staffing plan requirement that we discussed for 53.753(f) would be modified, and what we would do is include the following additional requirements for plants that require licensed operator staffing. So they would be required to provide a description of how the STA position as defined by the definition we just went through will be implemented during all plant conditions other than cold shutdown or refueling while shutdown, or alternately shall provide a justification for omission of the STA position. That is supported by relevant human factors engineering-based analysis and assessments.

So the justification for the omission of the STA would be described in high-level language within the rule, but at the level of guidance we envision that the general criteria associated with reviewing such a request would include considering several factors in aggregate that go above and beyond just those general criteria. And these factors would likely include -- and again this is an illustrative list. This is what we would have in mind for that type of guidance. These factors would likely include licensed operator qualification training, human system interfaces, design features, factors associated with the degree of reliance on human actions for safety,

and automated capabilities specifically as they supply additional defense-in-depth, and also serve to reduce workload.

So again, here we have another alternative that we've thought through, another way that we feel could be an acceptable approach here where in lieu of a blanket elimination of the STA under Part 53. The presumption would initially be that you require the STA until you can prove otherwise, but in doing this what we think we would ultimately achieve is we would provide clarity regarding the ST requirement. It would be very explicit that you need to have the STA unless you go through a relatively well-structured process for justifying its absence.

And if we could move onto the next slide, please? Okay. So on this slide we provide a third route. And again this one is a bit more generic in nature than the previous two, but what this third track would potentially entail is that we would instead require that the proposed staffing plans that we discussed would need to account for the means by which on-shift engineering expertise would be provided.

And such an approach would likely be accomplished by modifying the requirements of

53.753(f) that we discussed such that the staffing plans that were submitted would need to describe both how the numbers and positions of licensed operators provide assurance that plant safety functions can be maintained as well as how on-shift engineering expertise would be provided the down shift crew. And again what this would do is allow for some flexibility in the mechanism by which that is achieved. It may not being a distinct individual. It could be a combination of experience and training requirements that are committed to and so forth. But again, just a third alternative that's there.

And so in light of those three alternatives what I'd like to emphasize is that our current perspective remains that any such STA position requirement would only apply to plants that require licensed operators. So again, when we talk about codification of the STA requirement, we envision that as still only applying to a plant that requires licensed operators. And that perspective is based on our current approach and what that centers around is the fact that we have technological criteria that we've proposed under 53.755(b) for determining which plants do and potentially do not require licensed operator staffing. Again, we see that those criteria

would serve as a high safety bar for STA omission within that context.

So again, that rounds out the STA part of the slides that I have prepared, so I just wanted to pause and see if there were specific questions regarding those points.

MEMBER HALNON: Yes, so this is Greg Halnon. I'll start off with just a -- I guess I'd like to know if you don't do the blanket elimination did the staff have a preference on which alternative you guys would go with?

MR. SEYMOUR: I think that based on -- and again, I'll qualify this by saying that some of this reflects my own perspectives. Again, I don't want to speak for the entirety of the organization, but I think within our working groups that have been addressing this problem I think that we're comfortable potentially with any of those alternatives. I think the one that we have the most experience with would be the codification of the STA because again we do have experience with doing that case-by-case review and determining on a case-by-case basis whether there is justification to omit that role.

And we also acknowledge that with new designs where there's uncertainties in the designs

that there can be a lot to be said for having that extra person representing accident analysis and engineering expertise available to help offset some of those uncertainties, especially until there's a good body of operating experience that's been developed for a design.

MEMBER HALNON: Right. Okay. Well, I'll go -- I'll walk through my opinions and then we'll let the other members jump in, but as -- going through it I didn't have a preconceived notion that somebody -- there had to be an extra body. I really was interested in making sure that the expertise was available to the operators in order to -- especially with the new technologies that we have. And as we get more operating experience it may prove that it's not as necessary as we might think right now.

But certainly I thought this last alternative was -- would satisfy from the standpoint that the staffing plans would explain how they would provide that on-shift experience, whether it's somebody who lives down the road or somebody that's actually in shift. I'm not looking necessarily for a specific dedicated body, although I think that we've, like you said, proven the effectiveness and the value of having someone like that.

So I think that we're not -- at least I'm not comfortable with the blanket elimination only because since we're doing such a wide band of technologies and some of it we haven't even probably conceived of yet, I don't think that we should start with none and force the staff to justify why you need one as opposed to the other way around. The licensee should be able to -- if one is certainly not needed, then they should be able to justify why one is not needed.

This last bullet does give me pause though. And I'm not trying -- I'm not attempting to diminish the value of a GED, but theoretically you could have a shift of operators handling an issue at a plant that you have no advanced degree beyond a high school education, granted albeit probably a good training program because that's approved by the NRC, but I'm not sure why you would just limit to that where you have required for licensed operators.

Now maybe it's not as necessary to have one on shift or maybe it's not as necessary to have one within an hour or two hours away, but why would you not think that some of this technology even though it's not required for design-basis-type accidents or response or defense-in-depth -- why would you all not

think there needed to be something on these other new technologies that may not require license, but certainly have a lot of maybe control manipulations and other things going on?

MR. SEYMOUR: So the current perspective shaped by primarily there is the criteria that we've been proposing that would screen plants that don't require licensed operators. There's a few different layers to those, and there are two distinct proposals to probably go about doing that, but a key theme that's imbedded in both is that there isn't a pronounced operator role in the safety outcome for that facility. So --

MEMBER HALNON: But that doesn't make the plants any less complex from a physics perspective though.

MR. SEYMOUR: No. No, and that is a point that we definitely agree with. The thing that I would say is that some of our thinking with the Certified Operator Program was built out of our thought process regarding how we would address an autonomous reactor. So part of your thinking was derived from if you have a facility that theoretically could run autonomously, right, that can meet these criteria and show that it's safe, if you could remove everyone from the equation

except for someone who's there to handle administrative functions and maybe start the thing up initially, then why wouldn't you also remove the shift technical advisor within a context as well. And that was part of the factor that shaped our thinking.

MEMBER HALNON: Yes, I don't disagree with that, but then again going back to the previous blanket elimination versus not, it would be a simple case to justify technically why I wouldn't need one as opposed to the same way I justified I wouldn't need an operator. So I don't see why you would remove that requirement to at least put the onus on the licensee or the applicant to explain why this is so technically simplistic. I don't need to have anybody with an engineering or physics degree available to the operators.

MR. SEYMOUR: I'd like to add that as I mentioned before we're completely open to feedback on this. And that insight that perhaps is not appropriate to go with that line, that's something that we're definitely open to considering. As I mentioned, this is our current perspective on potential ways we could address the STA position and where we would draw that line. It would be --

MEMBER KIRCHNER: This is Walt. Greg, I'm

with you on this. To think that operating a multi-megawatt, even though it's a small inherently safe autonomous whatever, machine that we haven't built or no operational experience with, et cetera, et cetera, that it's -- that you would have -- you wouldn't have someone who had some technical knowledge of how this particular facility works -- to treat a operating power-producing reactor as an administrative function instead of a -- I don't get it -- where you wouldn't have someone who knows how this thing actually from a physics standpoint works. I'm with you Greg. I would think that it would be a tall bar to say you just turn this over to some administrator, a 10-megawatt reactor, and it's just somebody who has no technical background, no understanding of the physics of the reactor system. I don't find that credible even.

So I would -- I'm with you, Greg. I would --

MEMBER HALNON: Yes, I think it --

MEMBER KIRCHNER: I'm really dumbfounded to think that --

MR. SEYMOUR: Well, I think it goes with the original thought about becoming certified operators. But I think when you add in the -- what you said, first of a kind could still be technically

complex only because you can add a bunch of systems and complexities to prevent having had licensed operators. In other words, you prevent having to have operators respond to things. But again, the physics, one, it's probably not a traditional reactor core like many people have in their minds.

But secondly, the physics of fission and releases and sort of thing still is there. So you still have to have, like you say, knowledge of physics and whatnot.

MEMBER HALNON: So I think that's some feedback for you Jesse. I think overall I think that we probably would like to not see a blanket elimination in any case. And this other piece, what we just talked about, I think it would take some more thought behind whether or not we would be willing for that.

I'd like to see if there's any other members that had a thought. Dennis, you've got something I'm sure.

MEMBER BLEY: Yes. Yes, I'm got a couple things. I certainly agree with everything Greg said. And on this last aspect that he was talking about that you would tailor your language to fit a special case rather than a more general case and then have it

specialized by the applicant just seems backwards to me. So I don't think that's a good idea.

The other thing is I'm kind of all alone on this; and Jesse Ebersole formerly of this Committee 40 years ago was alone as well and neither the Committee nor the staff nor the Commission quite agreed with it, but the value of an independent set of eyes that you can get through an STA, if it's an independent position, can be invaluable. And unless there is substantial simplicity in the thermal hydraulics, the -- the ability to reach stable shut down, having that capability seems to me still very important. But that's all I had to add in.

PARTICIPANT: Sounds like there's a hot mic.

MEMBER BROWN: It's not mine. Somebody muted me. It's Charlie. But that was not me. I wanted to chime in. The other person is gone now.

PARTICIPANT: Yes, they're gone.

MEMBER BROWN: Okay. I totally agree with Greg and Walt. I can't see this falling to a default that you justify having an operator as an -- or an STA.

The second thing I would observe is everybody's got the idea that these plants are so

simple, so safe that you can walk away and ignore them. I mean, it just -- I'm getting a little bit upset by hearing this all the time. And then have this idea the requirement only applies to plants that require licensed operators. I mean, all these plants have systems that have to be controlled and the most sophisticated automation in the world is not going to cover you for everything.

And I know that from personal experience. And I can't tell you the details, but a very sophisticated we put in to -- it was working beautifully and all of a sudden we had an unanticipated multiple component failure. And if it hadn't been for the manual backups and the operators to be able to take control of a couple of key systems we'd have been screwed. Pardon my French. It would have been terrible.

And I just -- we should not go in that direction in my thoughts anyway. Any changes or any decision to not have operators or an STA should be based on them justifying it and convincing, not giving it away in the first place. That's -- it's just -- I'm appalled by even the thought process. Excuse me for being emphatic.

MR. SEYMOUR: What we'll see too as we

move through the slides, I will provide a recap of the criteria that we're proposing as a bar that determine which plants do or don't require licensed operators. So again, we're not just providing a blanket out in all cases with these proposals. Again, even where were tie things in with licensed operators, if the STA criteria were linked to that boundary, then there's still a test that would have to be passed from a design standpoint.

MEMBER HALNON: Yes, we'll get to the certified operators here in a few minutes because that's a little bit of a different topic, but I think what Charlie was saying, and I think Walt as well as myself, is that the inherently safe reactors that don't need an STA don't necessarily mean that they're inherently non-complex or simple in that respect.

So I think we've made our points. I don't know if anyone else wants to jump in there, but I think those are the main points for STAs.

MEMBER DIMITRIJEVIC: Well, I wanted to add something I just recently talked about that -- and it's that we cannot -- the new initiated to the control staff, we can -- that will be like world-size epidemic which affect the multiple crews. And we have never considered that as a risk because we never have

those cases with operating plants and things. So I thought that will be interesting given our colleague situation. So in the general I should -- think there should be some requirement the plants can be put in the same shutdown without operators in the control rooms.

MEMBER BROWN: I don't disagree with that, Vesna. Our systems out to be able to do that, but they won't always do that.

MR. SEYMOUR: Okay. Well again, I appreciate the feedback. And I just want to highlight that the approach, like the underlying intent here in laying out these options and explaining the thought process behind them was to get exactly this type of feedback from this body, so I do appreciate that. And we'll take the notes from this discussion. And again, we put out our first iteration of the rule language, but we're taking all this and bundling it together for how we approach our next iteration, so I do appreciate the feedback and the insights.

If it's okay with the Committee I'd like to go ahead and move into the next topic, if that's okay.

MEMBER HALNON: Yes, go ahead, Jesse.

MR. SEYMOUR: Okay. So if we can move

onto -- okay, we're on slide 53. Great.

Okay. So the next topic that I'd like to move into is load following, and I'd like to begin again with a short recap of the preliminary requirements that are under discussion. The 53.755(c) would restrict who is allowed to manipulate the actual facility controls; and again these are the actual reactivity controls, to only licensed or certified operators.

In tandem with that 53.755(e) would require the operators -- would require the operations-assigned actual control manipulations that affect reactor power level only occur while plant conditions are being monitored by a licensed or certified operator. Now we would build into 53.755(e) another layer though. So load following would be permitted provided that certain conditions are met such that demands from the grid operator could be immediately refused and they would either challenge state of operation or when precluded by plant equipment conditions such as might be the case if you have a technical specification action statement that allowed power level.

Specifically this would need to be accounted for by means of either the actuation of an

automatic protection system, an automated control system, or by a licensed or certified operator. And so Committee has asked for more discussion how this would be accomplished and what I'm going to do on the next slide is step through how we presently envision important elements of this playing this out as we further refine our requirements and guidance in this area.

Move onto the next slide, please?

MEMBER HALNON: Hey, Jesse, before you move on; this is Greg, at least in my training in the past we kind of broadly define reactivity manipulations. So if somebody was adjusting a feedwater control, we would -- and it changed reactor power, we would call out at least an indirect reactivity change. So I'm having a struggle between the conflict between (c) and (e). Could you spend a little time on what you meant by other than control manipulations that change reactor power that not necessarily falls under the broad definition of (c)?

MR. SEYMOUR: So the type of manipulation that you just described is something that would fall under 53.755(e) which is itself derived from -- it's modified from an existing 50.54 requirement. And what this means is that when you're dealing with item (c),

which again mirrors the similar 50.54 requirement, you're talking about a very narrowly-defined set of reactor controls, right? So traditionally these would be things like manipulating for boiling water reactor recirculation pumps. These could be rod control switches, the actual boration or dilution controls, those types of things.

Now when you start getting out to the balance of plant and you start dealing with the types of things that you're talking about -- this could be feedwater, this could be turbine controls, this could be things like steam generator blowdown, things that are going to change the efficiency of a secondary and cause a power change. Now you're talking about things that are indirect but still have an effect on reactor power.

So the current wording of 50.54 talks about knowledge and consent. Here we've made a change to that and we've changed it to monitoring to allow it to work better in tandem with the load following requirement but still maintain the overall requirement for someone to be watching while this is happening.

MEMBER HALNON: So the grid operator, what would they be manipulating to change power or megawatts out if they're not changing reactivity in

some direct or indirect way?

MR. SEYMOUR: Well the thing about the grid operator is that that would be an indirect power change, so -- by the grid operator sending a demand signal to the turbine. And that demand signal may be trying to accomplish more than one thing, right? You could -- maybe you're trying to adjust voltage control, right? So perhaps you're going to change the bar output of the generator. Perhaps you're trying to add frequency support for the grid so you're going to go ahead and raise the actual load-out of the machine and so forth.

But those turbine control signals -- functionally what would be happening there is really no different than a current licensed operator going up to the turbine controls of the plant, changing the speed of the machine. And then over on the primary side you now have the actual plant response to that, again indirect in that you're not actually using, again if it was the BWR, the recirculation pumps to cause that change. But again, functionally you're accomplishing the same thing. So in many ways what you're allowing for is this grid operator to fulfill the type of function that formerly would have restricted to balance of plant operator or anybody in

any case through indirect manipulation is doing some with knowledge and consent --

MEMBER HALNON: Okay.

MR. SEYMOUR: -- which is part of the reason we built in the requirements that we did.

MEMBER HALNON: Yes, I think that context was important to understand going forward, so thanks for the explanation.

MR. SEYMOUR: Okay. So, yes, if we could move onto the next slide, I'll go through and I'll expand upon these points here.

Okay. So to begin with this area is one where we currently envision high-level regulatory requirements like what I showed on the previous slide being elaborated upon by guidance. And in near term our current intent is to locate guidance of this type within an ARCAP ISG. And that particular approach serves a dual objective of facilitating not only this work for Part 53, but also lays groundwork in case we encounter exemption requests outside of Part 53 as well. So again helps us to establish a framework for that type of thing that would remain an encounter for a advanced reactor application.

So at this early stage -- again what I'm going to do is illustrate aspects of our thinking

right now, but I don't want to give the impression that we've exhaustively vetted this out yet. But what I'll do is I'll step through a few items that take the rule language that we've discussed and show how at a guidance level that type of thinking would start to expand out.

So first, load following -- and again, this is our current perspective here. Load following should be restricted to power levels where plant automation can support plant operations that are needed. And the key there is that you need to be able to provide a level of support that's sufficient to avoid initiating plant transience due to attempting the load change. And the underlying principle there is that from a risk standpoint we don't want to have routine load following creating initiating events. That shouldn't be something that we're seeing on a routine basis. And I'll provide an example of what we mean by this.

So let's say that a plant has multiple trains of feeding condensate. And again, if we're talking about any type of a large design there's a break point where you'll start seeing more than one train of that, but it's a useful example. So let's say that you have more than one feeding condensate

train on the secondary. And at this plant we'll say that it's running at 80 or 90 percent power and you're going to do a power reduction. So as you reduce power around the 50 percent point you need to secure one of those trains of feeding condensate.

If the automation couldn't handle that type of secondary plant operation; perhaps the nature of the controls, perhaps those valves out in the field, so and so forth; and again, I just this as an example, then that restraint, that 50 percent would become the bottom of the allowable load following envelope, right? You don't want to initiate a plant transient.

Now from a practicality standpoint; and again, when we start talking about automation on these designs, this can get complex. So there might be ways around that. So perhaps the plant is designed such that it's going to transition over to steam dumps at some minimum power and thus keep itself above the point where the automation wouldn't be able to handle going lower without human intervention and essentially you'd be idling at the bottom of that envelope waiting for -- to pick back up. Not great for efficiency. But that might be someone's integrated solution for how they want to approach the low end of a control

band.

The bottom line is that from our perspective right now if someone wants to credit a control system to approach this, then that control system needs to be able to manage and enforce the need to band in a reliable way.

And second, let's say that a facility were to opt to go with reliance -- and again these could be combined, right? Some of these may be combined in their approach. But let's say the facility were to opt with going for the actuation of an automatic protection system and using that to truncate or terminate load following.

From the standpoint of conservatism any such protective set points associated with that scheme would reasonably not be the same as those credited for core protection. And in our perspective those types of set point should be more restrictive than those that are being credited for safety purposes. And again, the underlying principle there is that our current perspective is that load following would be an allowance being made to facilitate economic considerations and safety system set points should not be expected to be challenged as part of achieving that.

Also let's keep in mind that the top of an allowable power band might be reduced by something like technical specification action statements. And again, I use the example of perhaps due to flux distribution or something like that you get yourself into an action statement where instead of 100 percent power you're restricted to 75 percent power. The key thing is that those types of set point schemes would need to be able to adapt to match any such operating constraints.

And again, as I go through these what I guess the underlying thing I'd want to illustrate is as we worked through this problem we had ultimately ascertained what the guiding principle would be, and we would take that and then use that to create the technology-inclusive framework to where we may see advanced technology that doesn't necessarily fit something that we've dealt with before, but we would apply this type of thinking to determine if what was being proposed was reasonable.

MEMBER BLEY: Vicki and Dennis both want to make comments.

Vicki, you've been waiting.

MEMBER BIER: Yes, that's okay.

So I assume that the enforcement of those

bands like not load following below 50 percent would be on the plant side, not on the grid side because the plant can't rely on the grid to enforce the level of safety and cybersecurity that it needs to maintain?

MR. SEYMOUR: That's absolutely correct in our thinking.

MEMBER BIER: Yes.

MR. SEYMOUR: These features would be a function of the plant's license, so this would be something that would have to be done on the plant side.

MEMBER BLEY: The question I had, will your language in any way preclude designs that allow safety set points to be adjusted based on your current operating power?

MR. SEYMOUR: From o what we're proposing here, no. And again, what I want to emphasize here is that what we're not trying to do is trying to in any way override or supersede any other I&C types of requirements that may deal with reactor protection systems and safeguards actuation systems and things of that nature here.

I think the key point is that if we were to think about what are the set points that end up in tech specs, what we're talking about is that's the

actual safety-related box, if you will, operating box. We would want to be more conservative with that. And that would be the underlying principle here is that what's being in this arena should be more conservative and should in no way interfere with the actual safety set points.

MEMBER KIRCHNER: It seems to me -- this is Walt Kirchner. It seems to me, Jesse, this would require a lot of -- you would want to stay within tech specs, a lot of the tech specs, and not challenging the safety limits or core protection, as you say it here in the second bullet, sub-bullet. This would be a pretty sophisticated system because, as Dennis I think was pointing out, it's a rather dynamic thing. It depends -- and rate is another factor in all this. Rate of power change often through reactors is a critical matter in terms of cool down, heat up. Depends what the technology is.

But it would seem to me you would have to have a protection system -- not a protection system, a control system that ensures if you -- if you let someone drive the plant based on the load from the back end, then you would have to have a system that kept you well within your tech specs and your operating envelope, and a lot of that currently for

the large plants is done by the operators.

MR. SEYMOUR: Yes, and the international operating experience that we drew upon when we were working through this, that was the solution that we saw there, was that there was direct operator oversight of this and the operator retained the ability to override it.

We're trying to be flexible and performance-based with what's allowed for here, but in all honestly the third bullet; which I was going to talk about that one next, where we simply have the operator that's there maintaining that continuous oversight, having the ability to take control, that is from the operating experience kind of the clean way to do it.

In the absence of that the other cleaner way to do it is, if we look at that first bullet, where you've got an automated control system perhaps the operator sets a band, right? The operator is responsible for knowing the technical specification action statements that are in effect, what the plant limitations are, and they simply program in an allowed band that meets that. And that's where I say certain combinations at least on this could be used. But again, it would be -- the onus would be on the

applicant if they wanted to use any of these options to show how they were able to do it.

MEMBER KIRCHNER: I think you need some more -- well, you're suggesting that you would supplement with guidance, but I think I'm having a problem with the word even transients. Every time you chase the load with a reactor you're in a transient mode of operation. So it's not that you want to avoid transience. You want to avoid getting the reactor outside of its operating envelope. But load following is a transient, and that's what the operators do.

I'll think some more about this, but I -- the load following envelope that you approve should be defined such that you don't challenge the safety systems, that you don't go outside our operating envelope as per tech specs, et cetera. So yes, I think this needs much more guidance. And I think some of it could be rather more -- not guidance, but regulatory, worded in regulatory space rather than guidance. I mean you don't want an automated load following event to take you outside your tech specs envelope.

MR. SEYMOUR: No, and to be honest --

MEMBER KIRCHNER: And that doesn't mean -- and that should give you sufficient cushion that

you're not challenging the safety basis of the plant. I didn't say that very well.

CHAIR PETTI: Isn't that if it's designed --

MEMBER KIRCHNER: Your critical set point.

CHAIR PETTI: I mean, Walt, if it's designed to be able to be load follow -- I think of it as these multiple boxes. There's a safety envelope. That's a big box. Then there's a design envelope that includes, quote, nominal steady state plus any load following space. And then below that would be what we call maybe the conventional -- if it just always ran steady state like U.S. plants do.

And so isn't it just an issue of making sure it's designed to be able to handle it? Because this is done in Europe. And so Jesse I think has answered my question, which was did -- were you informed by how this is done in Europe in terms of thinking about it from a regulatory perspective?

MR. SEYMOUR: Yes, there is an IAEA report that we reviewed as part of drafting the white paper that we in turn informed this with. And that --

CHAIR PETTI: That's what I thought I remembered, yes.

MR. SEYMOUR: But again, I appreciate you

coming back to the point about the analogy of boxes, because again that's a central theme that's here is load following -- and again, just to be honest for it to be frank, load following is something that's more of an economic nice to have, right? And that should in no way be allowed to challenge safety.

And that would be the key thing that -- whether it's high-level regulatory wording or perhaps more prescriptive regulation, that's the underlying goal that we've seen that would need to achieved here is that you're managing that and controlling that in such a way that that safety box that the plant is operating within is not the limiting --- what's happening is you're actually being bounded by more restrictive controls that are inside there.

And again, the human operator that's credited to take control, that's one possible way to do it. Another thing is a combination of human and machine where the human is using settings that are being input into automation and kind of working in tandem with a control system.

From what I've heard and what I've picked up here and there I perceive that as probably being the most likely application that we would see of this, but again our current thinking is, at least on this

first iteration, to try to be as flexible as reasonably possible and hence the allowance for the set points and so forth.

CHAIR PETTI: So to me the other application -- I don't whether I'd claim it; it's sort of economic, but these micro-reactors on micro-grids in remote locations where an area has its own grid and the load follow is just to deal with the cyclic demand over time, morning versus evening, winter versus summer, as opposed to being connected to a really large grid in a major metropolitan area. And I think there things are a little different in terms of how all it works in the -- whatever technology you selected is important, but I've seen some analyses to suggest that this is doable for the micro-reactors.

MEMBER HALNON: Dave, that's helpful for me because I've got this paradigm I'm thinking the large light water reactors and how difficult it is to operate those when someone else is moving your reactor.

CHAIR PETTI: Yes, well, some of these use open-air Brayton cycles --

MEMBER HALNON: Yes.

CHAIR PETTI: -- and the reactors -- you can do a lot with de-coupling the secondary side from

the primary, stuff that we just don't do in the -- with water reactors. There's a lot of design space out there, so it will be interesting to see what comes forward.

MEMBER HALNON: Yes, because the poisons that build in like xenon over time when you're moving power around is huge in a light water reactor, so I'm not as versed obviously in the smaller ones that maybe not be as big a problem, but you'd certainly have to -- the frequency of moving the power around, if it's the reactor power or power coming from some kind of nuclear fuel, you have to be mindful of the frequency of moving and the magnitude of moving that power around as well.

CHAIR PETTI: Yes. Yes.

MEMBER HALNON: One other question I had is -- and I -- if we're saying that the operators have got to be standing right there watching this and being able to reduce it, with the way the U.S. grids are done -- and I got what Dave just said about the micro-reactors, but right now the dispatch calls the operator and the operator changes the control or changes the reactor power. Why not just stick with that? I mean, is it because we're trying to catch all the cases just as what Dave just mentioned or is that

just a very unique case?

MR. SEYMOUR: Again, some of the features that we have proposed within Part 53 are derived from -- and during the last meeting I kind of illustrated our thinking with the hypothetical autonomous reactor, that someone's able to build a reactor that has enough inherent safety to where it was allowed to operate without having a human operator overseeing it directly.

And within that framework, within that construct we extended that thinking out and we started saying, okay, well what are the other things that would have be accounted for? And one of them obviously was the fact that if there's no one there to control it, that design would by definition have to load follow, right? There wouldn't be someone controlling its generator output.

So in terms of the model of -- if you have a control room that's staffed and you have people that are there and those people are licensed to operate that facility, then from what I can tell looking at the international OpE, the current status quo was that there wouldn't be an huge difference from you're talking -- and I'm familiar with the type of operation that you're talking about.

You're there; you get a call from the grid dispatcher. Maybe it's a planned change on a schedule, perhaps it's something emergent, and you're asked to take your output and change it. And so you go ahead and you do that. It's performed by the licensed operators that are there at the facility. They'll probably have a reactivity change plan or else they'll come up with one soon that shows them when the expected xenon transience will occur and when to borate the loop, pull rods, so on and so forth.

What really challenges our thinking and causes us to try to account for this is if we take the advanced reactor themes that we're thinking through and we run them out to the extreme and we start thinking about that autonomous reactor, right? And I think that's really where you get into this.

Now I could see applications larger plants that still have control room staffing and so on and so forth take advantage of this, most likely being through a combination of automation and operator team, as I was talking about. But again, that autonomous reactor paradigm that's really what I think kick started thinking down this road.

MEMBER HALNON: Okay. But the other question is this is not necessarily an exclusive issue

for new reactors. I mean, what if an SMR came in and did a license under Part 50 or 52? Would this be available to them?

MR. SEYMOUR: So what I was mentioning earlier about how we foresee this guidance initially appearing in an ARCAP ISG, one of our thought processes behind that had been that the ARCAP is designed in part to handle near-term applicants that come in under Part 50 and 52 and want to do things that we would see within kind of the same sphere that we're looking at within Part 53 as well. So our intent is to supplement the ARCAP guidance to address Part 53 once we get to a suitable point.

But by locating that guidance there that would be one of its functions as well, too, is should we see that application that's requesting exemption, right, because again that would have to go through the exemption process; you'd need actually a couple different exemptions under 50.54 just off the top of my head -- what would happen is we would have to look at that exemption. We would have to say is it legal? Can we do that? And once it cleared that hurdle we would have the other 50.12 criteria that we would have to get through and we would use this framework to help guide our thinking in processing that exemption.

MEMBER HALNON: Okay. Yes, that makes sense. Okay. Thanks.

MEMBER BIER: Hi, Vicki Bier again. It seems like not so much just on this one topic of load following, but kind of more generally there is sort of a philosophical decision that has to be made between -- of how flexible this should be. And it sounds like the staff is putting a lot of effort into thinking of these edge cases like what about an unmanned reactor or whatever.

And I'm kind of torn because on the one hand I know that bureaucracies can be very inflexible and that if you put in an inflexible rule first and say well, we'll allow changes by petition, exemptions, and whatever, it may never come to pass that the agency actually approves those once the rule is in place. But it also means having the less-flexible rule up front also kind of gives more opportunity to learn from experience before some of those decisions have to be made.

So I don't have a clear recommendation on that, but just wanted to kind of flag that as a general issue.

MR. SEYMOUR: I appreciate that insight, and that's something that we've thought about, too, is

if we draw a line somewhere and we say we're not going to try to accommodate all the possible edge cases, then perhaps when we do see that edge case come along it's reasonable to say if it shows up, we'll handle it with an exemption. And then we work towards having the guidance thought through and so forth to lay the groundwork how we would handle the exemption.

One of our goals with Part 53 and part of the reason why we made such a deliberate effort in this portion of it to consider as many edge cases as possible was simply kind of the overriding principle that regulating by exemption isn't desirable. If there's a better way to do it, try to have a framework in there. So our bias coming in was to try to cast a wide net and try to have a framework that would handle as many of those edge cases as possible.

MEMBER SUNSERI: Hey, this is Matt. I had a couple of comments or a question here. So I've been sitting back listening to this whole conversation and it reminds me of something somebody said to me recently in that complexity is impressive, but simplicity is genius. It seems to me like we're making this very complicated to try to fit any possible situation that we can imagine coming forward with these advanced designs.

And when I think about the current regulation for licensing operators, it follows the systems approach, right, to qualification, which means you look at the tasks and equipment that those operators are supposed to be doing for the design of the facility they're going to be operating and you customize the training to that activity and the qualification to those activities. And it seems to me that model would fit very well with whatever comes to the future. So that's a simple process. I guess it gets complex in implementation and the details, but so do any of these things that we're talking about here.

Why do we feel the need to move away from that straightforward process? I mean, I saw the benefits that this is proposing, but licensees can already write their licensed operator exams as long as they're approved by the NRC. If a particular facility doesn't need a simulator, then it -- don't require one. So any comment? I mean --

MR. SEYMOUR: I think we'll get into I think more on those points here on the coming slides, so outside of this topic I've got other slides that will address the -- kind of the relative merits and pros and cons of having the certified operator track some of what we're looking to do with training and

additionally specifics on the simulator discussions. I think a little bit later on in this presentation I could probably flesh out some of those questions.

If I could I just wanted to go through the remaining bullets on this slide because we've kind of been talking about the operator aspect of it and I just want to kind of get that point out there, if I could, and then obviously continue fielding questions on it. But we've kind of been going around this one particular item, and the third bullet that's on here, right, talks about crediting operators if you wanted to take that route.

And if that approach was taken, again our thinking there is that you'd be crediting the operator to arrest load following when needed. And in our mind that would warrant showing that those operators would be available to immediately take control of those load changes if you're going to challenge limits or challenge plant reliability, and that's a given within the existing Part 50 framework. And I think we were talking about that earlier, how that framework -- yes, you have a control room and yes, you have a certain number of operators as they are pre-scripted.

But one thing to keep in mind is that the current -- when we look holistically at Part 53 and we

consider how the different flexibilities and potential outcomes would look, Part 53 allows for substantially greater flexibility of staffing including flexibilities that could mean that a traditional at-the-controls operator isn't necessarily present at all times. And that might be the case with a highly-automated plant that lacks a control room.

So when we get to that third bullet talking about crediting operators take control, I just want to emphasize that part of the reason why we're emphasizing that is because based on the concept of operations for that facility and the degree of automation and safety and how operators are credited you may not necessarily have that person right there at that point in time. So this would be a more stringent application of the staffing requirement that if you wanted to take that route that would ensure that. And again, irrespective of what else might be required in the staffing model, if they were going to take that route we would want to see that they have the capacity for an immediate assumption of human control.

And then another point that I wanted to raise, too, and -- because we've kind of been talking about technologies, but I just want to clarify that we

don't currently foresee restrictions envisioned on the facility types in a strict sense provided that an adequate design could demonstrate it. So again, the onus would be on the applicant to show how they can do this, how they can meet the criteria, how they can do it safely. We wouldn't necessarily say only micro-reactors can do this or something like that. It would be here's the criteria; they're performance-based; show us how you're going to do this safely.

And I think there was another question that the Committee had posed about would we envision the use of certified operators potentially within this context? And our current thinking is that if the plant was -- if a plant met the criteria for the use of certified operators and they elected to do that, that that would be acceptable, that you could do this at a plant that had certified operators.

And the basis there is ingrained in the regulation that we would propose for certified operators would also be the need for them to demonstrate competence in conducting radioactivity manipulations. That is part of their training and evaluation. And then also that they would be authorized to conduct reactivity manipulations per the preliminary rule language.

So again, I appreciate your patience. I just wanted to kind of get those other points out here since we were talking about several of them.

MEMBER BROWN: This is Charlie.

MR. SEYMOUR: Okay.

MEMBER BROWN: I just wanted to follow up. I kind of agreed with Matt; I just didn't speak up earlier, relative to we're trying -- and Vicki as well dealing with all these outlier edge circumstances, which is complicating and confusing in terms of what your reasonable -- what you're trying to put together, whether it be operator training or whether it be what the level of automation is or et cetera. And the idea that you can't deal with exceptions within the rules, we deal with exceptions within the rules as they exist today. And it's already happened on at least one of the plants we've reviewed where they changed what was required and it was run through the system and it was approved.

So I mean, the idea that you -- the way I always operated was if you didn't have exceptions, you wouldn't need rules. But the rules ought to be pretty clear. Tell people what you expect. And then if the circumstances dictate otherwise, let them tell you why. I think you really ought to recast some of these

instead of trying to just cover the waterfront. That's my personal opinion. I think I'm a little bit in concert with Matt. Probably not all the way, but in some circumstances. So that's -- just give you another thought from one other member who's listening to this.

MR. SEYMOUR: Okay. Yes, I appreciate that.

MEMBER BROWN: This is Charlie Brown, by the way.

MR. SEYMOUR: I just wanted to, you know, highlight that we agree that, at least within the portion of the project that we're working on for Part 53, that there is a reasonable cut off to where you could say if this ever shows up we'll just deal with it before exemption. It's probably unlikely to happen, you know, in the foreseeable future.

Again, kind of for our first preliminary shot on putting this together, that kind of high level goal was, you know, if you can avoid regulating by exemption to try to do so.

So that was our first type of -- you know, again, we do appreciate the value of having that perspective, but there are certain edge cases that, frankly, make things too complex and too convoluted

trying to account for, especially when we don't see them on the radar in the foreseeable future.

And at that point, you know, my perspective is that, yes, it's probably most efficient to say if that shows up we'll handle an exemption space.

MEMBER HALNON: Yes, and one way you can deal with type of stuff is to --- and this just popped into my head, so don't ask me any questions --- is you can put in the regulatory language saying if you desire to have load following, submit a load following plan to the NRC for approval and then, in a guidance document, put your expectations in what that load following plan would have. And that would at least key somebody in saying that you're open to an exemption in this area or a portion of an approved plan.

So just a thought off the top of my head, and I think that could probably be applicable in many areas that we actually got through this type of language, just to make it more simple.

MR. SEYMOUR: Okay. Yes, I appreciate that. Another question from ---

(Simultaneous speaking.)

MEMBER BROWN: This is Charlie again on

load following. There are a lot of plants that are operating in this country, not commercially, that are load following, and I mean significantly load following.

MEMBER KIRCHNER: Exactly, Charlie, yes.

MEMBER BROWN: You can design these plants to be load following, and there are ways to put limits of on, you know, what you can do. Admittedly, they're not connected to a grid where, for instance, a total loss of part of the grid can really slam a bunch of plants with a load demand.

But you can cover that. And whether it results in a shutdown or whether it results in just a tripping of the main turbine generators, or whatever it is, you can do load following. And it's not really all that hard, and you can do it. And you're still going to have to have an operator somewhere, but you can do it even so that the plant compensates for that reactivity-wise.

So, I mean, this is --- we're making this awfully complex. It's my own thought process.

MR. SEYMOUR: Okay. Were there other questions on this topic? Or else I'll go ahead and move on to the next topic which is going to get into the certified operator program.

Okay. If we can move on to the next slide, please.

Okay. So now I'd like to transition into our certified operator related discussion topics. And again, because this discussion will reference the reverse requirements associated with those operators, I'd like to provide a brief recap of some of those items over the next couple of slides.

And again, I won't spend, you know, more than a minute or two just kind of rehashing some of those high level requirements. And then what we'll do is go ahead and get into the committee's questions.

And so to begin with, so 55.755(a) would require facility licensees to have licensed operators unless they can meet the criteria of (b) for using certified operators instead. And (b) currently contains two different staff proposals for those criteria, for what they could be.

So the first proposal that we currently have out there says that we would require any such facility to not rely on human actions for event mitigation in meeting the safety criteria of Sub-part B, for fulfilling safety functions, or for defense in depth.

It would also require a PRA showing that

the evaluation criteria for event sequences could be met without operator mitigation as well as the response to licensing basis events not relying on human actions to ensure the performance of system structures in performance.

The second proposal would instead require that the design basis accident safety criteria of Sub-part B would need to be able to be met without operator action for mitigation, or reliance on active engineering features, or passive design features, except for those passive features that can both survive licensing basis events and not be defeated by credible human errors. So then that's currently what we have in the way of criteria for those two items.

Can we move on to the next slide, please? Okay. So 53.755(i) provides specific requirements for plants using certified operators. Certified operator administrative responsibilities would include compliance with technical specifications, operability determinations, maintenance, and configuration controls, compliance with radioactive release limits, any responsibilities under the facility's emergency plan that may be assigned to them, and also making notifications as required.

Certified operator staffing would need to

provide continuity of responsibility for facility operations during the operating phase. And this would entail the continuous monitoring of fueled units and having the capabilities to receive plant data, initiate rapid shutdown, dispatch operations maintenance personnel, implement any emergency plan responsibilities, as well as conducting reactivity manipulations.

Can we move on to the next slide, please? Okay. And again, just two more slides for this overview, and then we'll get into the committee's, you know, items that were provided to us for discussion.

So 53.774 addresses requirements for the issuance of certificates by facilities having licensed operators. And those requirements would include there will be certified operators and other people being issued the certifications by the facility licensees, would need to have a high school diploma or GED, they would need to complete an initial training program, pass an initial certification exam. They would need to demonstrate confidence in performing reactivity manipulations, and they would also need to meet medical condition requirements.

We can move onto the next slide. Okay, this is the last overview slide. So lastly, 53.775

would address conditions that facility licensees would need to ensure are met, re-certification-met issues to operators.

These conditions would include only performing duties where they're certified at, continuing training participation, completing re-qualification examinations, having biannual medical exams, and also maintaining proficiency. So again, that's the overview of the requirements.

Could we move on to the next slide? And then I'll start going through some of the specific topics for discussion.

MEMBER BROWN: Can I ask another question?

MR. SEYMOUR: Yes.

MEMBER BROWN: This is Charlie again. I'm trying to wrap my head around -- it probably got covered and I missed it, but a certified operator then doesn't have to really understand plant thermodynamics, reactor physics, et cetera, et cetera, if I just look at what's required for qualifications. A GED certainly doesn't fall in that category. And no amount of training, unless you've gone to college and gotten a degree is going to compensate for that.

So a licensed operator, I take it, has, and I'm not as familiar with commercial plants, so

that's why I'm asking, I presume has a much higher level of academic and engineering background than a certified operator. Is that also correct?

MR. SEYMOUR: So that's not the case within the Part 53 construct that we currently have laid out for licensed operators and certified operators. Both groups actually have fairly similar regulatory requirements for what their training programs and initial licensing has to be able to demonstrate. And that is they have to be able to, you know, have the knowledge and abilities needed for the safe operation of the facility.

There is a difference in that, because licensed operators also, you know, being credited with operator action for safety of those facilities, that those operators have additional requirements to go above and beyond that to deal with fulfilling and maintaining plant safety functions.

But fundamentally, you know, again this exists outside of the rule language, because this is something that we've been developing for, you know, guidance. But currently, the way that we've worked through and preliminarily established what we look to currently be putting into guidance for those areas, certified operators and licensed operators would both

have requirements for fundamentals.

So there would be requirements for the training, you know, and examination of those operators, particularly the examination. Because, you know, again, that's an important point. But the examination, whether it be a licensing or certification exam, would have to be inclusive of, you know, reactor theory, thermodynamics components.

And then above and beyond that, you know, if you start getting into the specific job tasks associated with those operators, again both sets of operators would have reactivity management, right, built into those programs as well.

But then, if you're talking about the licensed operators, you know, they may have more to do when you get into emergency operations, right, because of the nature of those facilities. So at that point, that's where you really start seeing the differences in training program content and so forth.

But just in terms of fundamentals of, you know, reactor theory, and ensuring principles of thermodynamics, and also being able to safely conduct reactivity manipulations, right now we see those as being a common track between both of those programs.

MEMBER KIRCHNER: So, Jesse, this is Walt.

Going back to Matt's point, I'm sitting in my dining room. So I'm not in my library, and I can't look at my license. But I always thought that NRC licenses, mine's an AEC license, so I'm dated, but the license is for a specific plant, is it not?

MR. SEYMOUR: It is, yes.

MEMBER KIRCHNER: So why not, as Matt was suggesting, why create this certified alternative? Why not just put in place the --- have the same fundamental requirements for theory, reactor physics, thermohydraulics, and then design a training program, a simulator if needed, et cetera, for the facility that the person's being licensed to operate?

It seems to me we're creating competing tracks that somehow --- it would be nice to see tabulated side by side what's required of a licensed operator versus a certified operator.

CHAIR PETTI: That's coming up.

MEMBER KIRCHNER: Coming up, yes.

MEMBER BLEY: Let's wait to see that, because I had some questions there.

MEMBER KIRCHNER: Yes, okay.

(Simultaneous speaking.)

MEMBER KIRCHNER: If we get to that, I'll hold my comments to then, sorry. Thank you.

MR. SEYMOUR: Okay. Yes, and that's why I'd recommend if, you know, the Committee's amenable to it is, you know, once I get through this slide and the two that come after that, that'll put a bit more, you know, kind of substance on the table to go through and parse this out.

But before we get into that, what I just want to reinforce is that it could have spilled upon our last, you know, discussion that we had. You know, we are very aware that if you draw a Venn diagram that there's a point of overlap between, you know, the licensed and the certified, even within this construct. And that's an offshoot of how we thought through, you know, the development of the two programs.

And that is something that we are receptive to feedback on, and we are still actively thinking through. It is, you know, and I'll go through, and I'll explain how got to certified operators here in a moment.

But something that we are receptive to, to work through future iterations of this, is perhaps better to just now, for the licensed operator program, you know, be able to scale through, you know, kind of those very, simple and safe facilities and so forth,

and be able to accommodate that and not to have a separate track.

So that is an outcome that you know, again, we're very receptive to feedback there. But to my point though, what drives us to considering how a non-licensed operator pathway like this in the first place?

MEMBER HALNON: Hey, Jesse, just to be clear for Charlie, the education requirements for RO/SRO and certified operators are the same. There's no advantage that we required for licensed operators unless you're going through the instant SRO route.

MEMBER BROWN: Yes. It's the STA that has the degree requirements, if I remember correctly. Isn't that right?

MEMBER HALNON: That's correct. Yes.

MEMBER BROWN: Okay.

MEMBER HALNON: Yes. The STA and the instant SRO.

MEMBER BROWN: Yes. I went back. Is the senior RO, senior reactor operator, does he have to have an engineering or some type of background in engineering --

MEMBER HALNON: Not for ---

MEMBER BROWN: -- or just the STA?

MEMBER HALNON: Yes, just the STA, not the traditional SRO.

MEMBER BROWN: Okay. That's what I thought. But --

(Simultaneous speaking.)

MEMBER BROWN: -- the training for the Navy guys, they go through the Naval nuclear program training. And they're not, you know, they're high school graduates.

MEMBER HALNON: Yes, there is a --

(Simultaneous speaking.)

MEMBER HALNON: There is the path to the SRO they call instant SRO that you have to have. That's when you don't become an RO first. But if you're an RO and then upgrade to SRO, there's no advanced degree required.

MEMBER BROWN: Okay. That's what I thought. Thank you.

MR. SEYMOUR: Yes, that's exactly the case. You know, with SROs, there is a little bit of nuance to how you can get there. And it's either going to be through having experience, a certain amount of experience in the RO position before you go up. Or you can have, you know, a degree and then come up through that track as well.

So, again, in the case of a person who, you know, they hire in as an equipment operator at the plant, they get the requisite experience, they get the reactor operator license, and then get the requisite experience, and then get the senior reactor operator license, you can have a senior reactor operator with a high school diploma working at a plant.

And my understanding of the research and test reactor requirements, I think that for the non-powered, I think that it's similar and that you can have someone with a high school diploma that's working.

And really, the place where we see the degree coming in as one of the possible tracks to meet the requirements to be an SRO and also, you know, we see it embedded in the shift technical advisor requirement.

But nominally, the way the training programs are configured, you know, there's fundamentals that are built into those training programs. The reactor operators, senior reactor operators and so forth, in the course of going through their training programs, do get trained in reactor theory, thermodynamics, and so forth.

So someone coming out of, you know, even

if they only have a high school diploma, someone that's coming out of an RO or SRO training program should be able to pick up, for example, a Mollier diagram and with the isenthalpic change of a leaking PRV and, you know, calculate what the tailpipe factor should be and so forth.

So again, just to clarify, there are, obviously there's, you know, there's a lot of knowledge that you would gain through an engineering degree that modern licensed operator training programs do have sub-sets of that, that are embedded in there. And again, it's mostly the practical, kind of, hands-on applications of some of that. But again, I just want to clarify that there is training on that.

So getting back to where I was at, so why do we consider having this non-licensed operator pathway in the first place?

Simply put, if a given facility were sufficiently designed such that there were no significant operator roles in the plant's safety performance, and again, this might be the case with, you know, a hypothetical, inherently safe, and autonomously operated design, a key factor that would have warranted the federal licensing of those individuals would then be absent.

And to put that in other words, if circumstances are such that operator performance would no longer have a credible influence on public health and safety outcomes then, you know, in our mindset what becomes the logical consequence of when we start thinking about, you know, the relative degree of independent assurance that we would need to have on those operator's abilities, and also for their overall level of qualification.

And so again, I put that out there to illustrate the type of thinking that got us kind of working down this road. And as we approach that issue within, you know, that context, regardless of whether operators are or are not individually licensed by the NRC, another thing to keep in mind too is that the facility itself was similarly licensed by the NRC and its regulated programs with the subjected oversight thereafter.

So again, I put that out there just to, you know, provide some of the data points that kind of framed our thinking as we first started navigating this. And as we worked through the process of answering those questions, we then have to contend with the reality that important administrative job tasks would still need to be performed by adequately

qualified personnel.

But if we look at those administrative jobs tasks ---

MEMBER BLEY: Let me interrupt you just ---I'm just thinking about first of the kinds. We do a paper design where we calculate, and we don't see anything where an operator is required to save the day with any high enough likelihood to worry about it.

But at least in the first few, if we don't require prototypes, there's going to be things turn up that operators have to do that we didn't think about. And I don't know how you cover that, but I would hope when the first licenses come through using this process there's a learning period of a few years, that is kind of like we'd get from a prototype, to make sure we've not been too sanguine about what people have to do to interact with these machines.

MR. SEYMOUR: On a later slide, I will talk at length about, you know, the possibility that a plant is built, and then we have something that changes, you know, changes the underlying analyses that comes up. Again, what I'll also talk about here is kind of a long view that we're taking with this language. And we'll get to that, I think, on the next slide.

MEMBER KIRCHNER: So, Jesse?

MR. SEYMOUR: Yes.

MEMBER KIRCHNER: Can I ask you a question here? It's a more rhetorical, philosophical question. I actually was proposing an autonomous reactor design in my earlier career.

But we always judged that there would be an operator role in that reactor design, such that if, for whatever reason the reactor was not functioning correctly and following its -- it wasn't shutting itself down, if it was outside of safety parameters, et cetera, that an operator would then initiate a safe shutdown, and monitor that reactor to make sure it had achieved safe shutdown, and decay heat was being removed, et cetera, et cetera, all those things that you achieve when you try to get to a safe shutdown condition.

And that involves an operator. And often, as Dennis was saying, for a first of a kind in particular, you don't know necessarily where this reactor is going. You think you do, you think you've designed it for every contingency. But until you get significant operating experience, I just can't connect the dots here to not requiring a licensed operator.

MR. SEYMOUR: Could we go back to Slide 56

real quick?

MEMBER KIRCHNER: Yes.

MR. SEYMOUR: All right, if we could jump back there. Because one thing that I wanted to show is that what you just brought up has weighed on our mind as we've been navigating through this.

And, you know, one thing that I know was in broader discussions early on in Part 53 development, talking about is it good enough that the plant has been there at a low power. What does it mean to be in a safe fail state, you know, and achieving sub-criticality, and so forth?

And we put our own spin on that here. And what we said is this, right. You know, there's no outcome in the proposed scheme that we have here where there's just nobody overseeing that plant.

And even in the case where we go to the, you know, the least restrictive outcome when you're allowed to use the certified operator, these items that I have pulled up, these last few bullets, talk about the things that these certified operators would need to be able to achieve at all times, right.

And what we see here is the ability to immediately initiate reactor shutdown. And in conjunction with that, also the ability to receive

operating data from the plant, you know, the ability to also implement any emergency plant responsibilities that they may have.

So in our thinking through this, we reached what I think is probably a somewhat similar line of thinking that, you know, even if you've gone through and you've said there's no way that this reactor would end up in the state where it's just not shutdown, you know, you would never have an ATLAS on this thing, and so forth. You know, we said, okay, that's fine. You still need to have someone receiving this.

And something too that I want to say about the way that we have the HSI design requirement structure with our proposed Part 53, there's no gradation of those requirements for licensed versus non-licensed operator plants.

And what that means is that the requirements to have things like, you know, safety parameter display system type of plant safety function data coming in, the information about the state of important system structures and components, core damage related information, and so forth, that would all have to be provided to, you know, the certified operators as well.

So again, what we found in our eyes was that that was the lowest point that we're willing to go to in terms of, you know, removing restrictions and so forth. There would still have to be someone who has an adequate training program, right, someone that is proficient, that is trained to have access to the right information.

And even if that plant can show that they have no human role in safety, we still want someone there with the ability to turn it off and to start making the notifications that need to be made if things go wrong from there.

MEMBER KIRCHNER: Yes, that was my point. These bullets are good. That's what's in my thinking. Even if it is an autonomous plant, you still need someone. We can debate whether it's certified or licensed operator, but you need someone to be able to do all these functions, even for an autonomous plant.

I mean, when I was doing this many, many years ago, we went through the same list of issues. We were looking at the autonomous plants on the north warning system to power radar stations that would be remote and autonomous.

But there would always be, the notion was, just like drones, that there's always someone behind

the operation of the facility who's monitoring, is getting the plant data, can affect a safe shutdown, can dispatch people to do whatever is needed to mitigate a potential release, et cetera.

So I had a problem with the --- now go back to the slide you were working on, just that to me it was a philosophical disconnect.

MR. SEYMOUR: So I guess, you know, just to clarify the issues here just so that I understand, with what we were discussing previously, even for our autonomous reactor, the hypothetical, we still would see that you would have that requirement there, right.

There will always be a certified operator, even if the reactor itself was running autonomously, there would still be someone, you know, with that rudimentary level if monitoring and controllability that would be there to turn it off, right.

So even though that person may not have to do very much outside the administration with that facility, you know, again, that certified operator with those capabilities would be mandatory, even for the so-called inherently safe autonomous reaction.

MEMBER KIRCHNER: Well, maybe I just misread this view graph thing. So the key driver for wording federal licensing of individuals is removed.

But you would still have a certified operator.

MR. SEYMOUR: That's right, yes. And the certified operator ---

MEMBER KIRCHNER: And that certified operator would be, quote, unquote, certified by the NRC.

MR. SEYMOUR: They would be certified by the facility. The facility would have an NRC approved program that they would be using to certify their own operators. But those certified operators would be non-licensed. That being said, they would have a fairly highly regulated training program that they would be subject to.

MEMBER KIRCHNER: All right. I missed that nuance then in my looking at all of your materials in advance. I thought that a certified operator would be certified by the NRC, not by the Applicant.

MEMBER BLEY: And that's probably the major difference, right?

MEMBER BROWN: Slide 61 shows that whole certification process when we get to it.

MR. SEYMOUR: Yes. And when I get to Slide 61, I'll go through and I'll show it. Because again, you know, when we discussed what's the benefit,

you still have this fairly, comparatively --- if you think about, like, and equipment operator, compared to what an equipment operator has to do, this would be a fairly heavily regulated program. So what would be the advantage for someone to pursue that? And that's what I'll get to in our main slides.

And if I could just wrap this one up, so we can, you know, get to that information, because I think that will help to clarify.

So again, we talked about the administrative responsibilities that remain. And again, one of the things that shaped our thinking is that, you know, we do have precedent and experience with certain non-licensed roles that do perform important administrative tasks, like the certified fuel handlers.

And then also, another matter that we've had to consider is, you know, what would we do if we see that there's ever an acceptable time where someone without a license could conduct reactivity manipulations? Because that would be part of the certified operator alternative.

And what we've thought through there is that, you know, for these plants where that would be occurring, under the specific performance criteria

those plants would have to meet, that it would be reasonable to allow these certified individuals to conduct them.

And our thinking in getting to that point has been that, you know, we approach that from thinking about the safety and also the risks posed by human error in conducting those manipulations.

And our perspective at the moment has been that, if a design can meet those stringent criteria, that one of the offshoots of meeting those criteria for using certified operators in the first place is that the consequences of such actions, right, such human errors, you know, people getting things wrong during a reactor startup and so forth, that those consequences could be bounded by the design.

And that, in conjunction with appropriate qualification requirements, right, you know, at the end of the day, you know, the training and experience requirements with regard to reactivity manipulations looking very, very similar between those two programs, that that coupled, you know, together would yield an adequate assurance of safety, irrespective of whether that person is licensed by the NRC or certified by the facility under an NRC approved program.

If we could move onto the next slide,

please. Okay. And again ---

MEMBER BALLINGER: This is Ron Ballinger. I have a question. And that is where does the buck stop? In a commercial plant, there is somebody in that control room who, if that person feels that they need to shut the plant down, they have the responsibility to do that.

Who has that similar responsibility in your scenario? In other words, who has the responsibility for the safe operation of the plant and can shut it down irregardless of what anybody else says?

MR. SEYMOUR: So this is where there is a difference in accountability that occurs between, you know, the licensed operator facility and the certified operator facility. And this is an important point of discussion that, you know, that we've had in getting to our current thinking.

Because when you talk about --- and actually here, I think on this slide or one after this one, we'll talk about aspects of that accountability. But what you see with licensed operators is that you have an individual who's licensed by the NRC and also a facility licensee, right.

And I think your point that you raised

gets into, you know, certain issues of safety culture and so forth, and what happens if you have kind of the Chernobyl scenario of people being coerced into taking the wrong action, and moving in the wrong direction, and so forth.

You know, one of the merits of licensed operators is that, because they are the ones who hold the authority to implement certain operations within that plant, that essentially gives them the ability to say no to, you know, management under those conditions, right. Because the person that would be telling you to do that doesn't have authority to implement it. So it is a powerful thing, right.

In our thinking with certified operators, what we've considered is that, you know, that level of accountability really rests with the facility licensee in that case. They would have certified operators, right, that are trained and qualified to operate those systems and so forth.

But, you know, the potential does exist that a certified operator may not carry the same ability to push back, right, because they are not holding that license that's independent of a plant's license. So how do we think through that, right?

And again, this gets back to, you know,

the reason why we've been very careful and tried to be very rigorous with how we've approached the criteria for those plants.

And in thinking about the safety criteria that a plant would need to have to justify that, one of things that we've taken into consideration is what do you need to do to minimize the likelihood that things like people restoring systems to serve when they're inoperable, and people committing operational errors, and so on and so forth. You know, what are the types of design considerations that need to be there to still give you a reasonable assurance in those contexts.

And that's why when we look at, and I'll give an example, right, when we look at the criteria of 53.755(e), again we propose two potential alternatives.

Well, the second one, you know, speaks to reliance on passive safety features, but it also amplifies those passive safety features, you know, can't be subject to being defeated by credible human errors of omission and commission, right.

And the reliance there is, you know, what that's really doing is it's pointing to the fact that we don't want to have a capability for people

restoring systems to service when the technical specifications aren't met. You know, perhaps there's valves that closed going to a heat exchanger.

But these really need to be very robust, very simple, you know, passive safety features. Or they just need to be things that are more inherent in nature. Because what we're doing as part of, you know, requiring that, is we're starting to remove where some of those dead organizational decisions can start, you know, removing the safety considerations from that plant.

And I think a good example is this, right. Let's say that you've got a plant that's coming out of an outage. You've got an operator that is verifying that conditions are met to change modes and start the plant up.

And let's say that we have some hypothetical management that will imagine this is a bad scenario, that's imagining that management is coercive, and they pressure the operator to go in and call the systems back into service when they're not operable, and then to go ahead and start the facility up and move into the higher mode.

You know, again, that's a situation to where we have to ask that question. What if we have

a certified operator, and they don't hold a license, and they don't have that same weight to push back, right.

And at that point, the way that we've thought about that, at least in our preliminary thinking that we have right now, is that by having a very high bar that that plant design has to get over in the first place, and the types of safety features and human roles that it's allowed to have to even be in that theoretical situation in the first place, that that would tend to mitigate the consequences from, you know, those types of issues.

But again, it is an important question. There is more to the fact that these individuals are licensed than just the fact that, yes, the NRC is coming in independently certifying their knowledge, and abilities, and so forth. There's also that authority that was granted by virtue of having a federal license. And it's a complex issue.

MEMBER BALLINGER: You know, I guess I'm just not sure I got an answer. I'll, in deference to Charlie, default back to the Admiral. The Admiral had to identify a single person for a single area that he could call, no matter what time of the day, if something went wrong. It was very important for him

to know who's responsible.

And I think the same goes for this case. We had six or a dozen fission batteries operating in a steel plant in the middle of a steel mill. And the administrative function is 150, 200 miles away, and something goes wrong, who is responsible for that system?

MR. SEYMOUR: So as a function of the plants with a facility license, and again, Bill, I'll definitely turn to you if you can add to this, but within the framework that we're working within, we still envision having plants, obviously technical specifications. You would still have Section 5, the administrative section of technical specifications. And we still would have guidance for the acceptable content.

And one thing that we see embedded in Section 5 of technical specifications are the organizational responsibilities. And within that framework, you know, if we're talking about the facility licensee, what you'll see within that framework is still people in management positions or corporate officers that are specifically called out as having certain responsibilities for that facility as well.

So again, even in this case where if we kind of disassociate, you know, the single point of accountability from being the operator, I don't know that we would necessarily say that it becomes, you know, this nameless, faceless corporate entity at that point.

I think that when we look at the way that, you know, the administrative section of the tech specs are structured, and I think -- and, Bill, please correct me, but I think even the way that we currently envision it still functioning under ARCAP is that, you know, we would have those administrative reporting chains and specific, you know, management and corporate responsibilities delineated in the technical specifications.

But, Bill, maybe you can answer that?

MR. RECKLEY: Yes, that's right. And basically, the parallel, and Jesse had pointed it out in some previous slides, once a facility enters decommissioning, we move to certified fuel handlers in fuel cycle facilities, or materials licensees. We are licensing entities, but not licensing individuals.

And so I think you would look to those types of licenses to see how and who, if it's important, well, it is always important, but who we

would hold accountable. There would always be an entity that would be accountable.

And as Jesse mentioned, the challenge here is in what we were trying to do in defining some criteria, and we gave it a shot with our first iteration, would be to try to say this particular opportunity to have certified versus licensed operators, it's a tall hurdle to have that opportunity.

And it would be limited to facilities that we thought would be more comparable to the radiological hazard of some of those other licensees than current light water reactors, for example.

So we are trying to thread a needle here, and we understand some of the concerns. Much of the discussion you're having, we've had internally many times, I can assure you. And so that's what we're trying to do in this proposal. But again, it's just ---

MEMBER BLEY: Bill?

MR. RECKLEY: Go ahead, Dennis.

MEMBER BLEY: Yes. There's one thing about this that the others were hitting on that kind of nags at me. You always say there's an entity responsible. We need a person, a real human being --

MR. RECKLEY: No, it doesn't ---

MEMBER BLEY: -- responsible, a particular one. And that's a place where, you know, I don't go back to Reckoner stuff very much, but if you got out of having the submariners, and you go to, say, an aircraft carrier, the executive officer and the CO had to be nuclear trained. Even though you had a key guy down in the plant who owned it, the head boss on that ship had to have that nuclear background. So it needs to hook to individuals. But you were about to tell me it does.

MEMBER BALLINGER: Yes. And he or she now would be the one that gets canned.

MR. RECKLEY: And as Jesse mentioned, the company or entity always has an officer, right. And so that's, I think, who we would ---

MEMBER BROWN: That's 200 miles away, Bill. It could be, could be 1,000 miles away. I mean, can you imagine what this would do to the nuclear program if one of these, quote, autonomous plants operated in this manner, started going haywire, and it just kept on perking along, perking along, until all kinds of other things happened? It would be destroyed. It would be over with, just like TAI destroyed the whole program here.

MR. SEYMOUR: If I can clarify though, I just want to, you know, kind of draw that line between talking about the corporate responsibility, the management responsibility, and designated corporate officers, and the fact we still go back to those other requirements.

But we're saying, you know, whether we're talking about the certified operator, and we can debate licensing versus certification, but we would still be mandating that this well trained individual would have plant parameters and would have the ability to shut that plant down.

And then, you know, even despite the analyses that said that it was okay not to have that person there, it's like they're still there to go out and shut everything down. And I should say, despite the analysis that said that, you know, it's permissible to not have a licensed operator and use the certified operator instead. This person would still shut things down.

And, you know, depending on, again, the plants, there's different ways that they could approach emergency preparedness and so forth. But in all likelihood, you would have this person also in a position with the plant parameters to go ahead and

start, you know, moving the emergency preparedness framework along.

MEMBER BROWN: So if it's not an emergency, well, how do you keep it, how do you know it's going to stay shut down? So he shuts it down and puts the rods -- whatever the facility is, who's going to keep it shut down. How do you know it will stay shut down, based on whatever's going on?

MEMBER HALNON: This is Greg. Let me just ---

MEMBER BROWN: I'm out of this.

MEMBER HALNON: Yes. Let me just put this --- even if you made the argument that, from a knowledge and proficiency perspective, the licensed operator is equal to the certified operator, and vice versa, I think the delta of not having NRC accountability personally on the person that's moving controls is the holdup.

So let's just assume they're exactly equal from a capability perspective and training perspective. That personal accountability, which is, I think, one of the questions we sent, is important.

And I know, Jesse, you're in the control room. And that, I mean, I don't know if you were ever put up against that pressure of starting up an outage

like you mentioned.

I was put up personally trying to keep the plant running when it should be shut down. And I shut it down. And I felt very emboldened to do that, because I had an NRC license, not a certification that I could probably lose my job. I knew I wasn't going to lose my job. So I think that that's where the discomfort's coming from, even if you just equal everything else across the board.

(Simultaneous speaking.)

MEMBER BALLINGER: Yes. You just never want to get into a situation where somebody has to pick up the phone and call the corporate office before they do anything. That happened somewhere in Japan one time not too long ago.

MR. SEYMOUR: Yes. And it gets back to the point that was just made about the unique nature of that authority and trying to think through those types of situations where that authority is really the thing that makes or breaks whether things turn out well or turn out poorly.

And again, that was an example that came to my mind. You know, you have those -- typically the things we'll read about, it's during safety culture training where you have these toxic environments and

people being coerced to do the wrong thing. And that operator license does grant unique authority to push back against that.

And that's been one of the, you know, one of the thresholds. And Bill and I have had many discussions about this debating the various approaches.

But one of the thresholds that we've kind of commonly agreed on is technologically, you know, the plant design -- and again, not going so far as to say that nothing can go wrong, and these plants are absolutely safe, and so forth, but any plant design where you would allow, you know, that plant to forego the individual license you have for operators, would have to have to have a very high safety bar.

Because you would have to be able to envision the plant design in its robustness being able to weather those types of situations. So again, this is a place where we're open to feedback. And as we've gone through, this process, we've debated, you know, should we have the certified operator track, should it just be gradations of a licensed operator.

And as we've moved through, you know, and we've kind of taken kind of a modular compartmentalized approach to this with an eye towards

a future iteration, if we just went to only having a licensed operator program that could be scaled and graded, what would that look like and so forth? So we've already done a lot of thinking along that line as well too.

So again, I don't want anyone to think that we're not open to feedback or, you know, changing our thinking on this, or taking a different approach.

MEMBER BLEY: So, Jesse, before we go to the next slide, we're getting close to our break time. I just, you know, you guys have said over and over again, it's a high bar. I keep envisioning that there just is not that much difference between the licensed operator and the certified operator in terms of the training. In terms of the administration of this, there's differences.

But, you know, the question that's still in my mind is, is it worth it if, in fact, it's such a high bar, you know, what's it really buy you in the end? So --

(Simultaneous speaking.)

MEMBER BIER: If I can --

MEMBER BLEY: Vicki, sure.

MEMBER BIER: Sorry. I can make one quick comment before we go on break. FAA has dealt with

that in the past. They certified pilots at airlines to give check rides for other pilots at the same airline.

And at one point, they found that pilots were certifying check rides that had never been given. And so that's another problem besides the individual not feeling kind of empowered is that, you know, there may be a culture where, at some plants, the person gets 12 tries to pass the test or whatever it is. So that's another issue.

I would say if you are set on going in this direction, I would look at the experience at FDA, sorry, FAA, whether they're still doing that, if so, how it has changed over time?

MR. SEYMOUR: I appreciate that point. And I mentioned this before --

(Simultaneous speaking.)

MR. SEYMOUR: Oh, sorry.

CHAIR PETTI: Go ahead, Jesse.

MEMBER BALLINGER: Yes. I don't want to beat a dead horse again, but I don't care whether it's a certified operator, a reactor operator, or whoever, whatever you call it, who has the ultimate responsibility for the operation of the plant that can shut it down, regardless of what anybody else says.

MEMBER BROWN: And keep it down.

MEMBER BALLINGER: Yes, okay. Well, first things first, I guess.

MR. SEYMOUR: So I guess just to close out the first item, and I'll address that, you know, I was mentioning that, with regards to the point about exam integrity and issues there, I spent five years doing operator licensing exams prior to what I'm doing now.

And something that we were always very respectful of and appreciative of doing that is that, with the NRC's process, even if a training program was completely deficient, even if there were things like, you know, rampant integrity issues and so forth, to where, you know, you give the example of a check ride where people weren't actually doing what they were supposed to do, there was still that final safeguard at the end of that.

And that is that the NRC would review and approve an exam and then they would come in and independently administer that. And no matter how deficient that training program had been, there was an independent safeguard at the end of that so that you would have some final backstop against that.

So again, it's a good point that we've brought up as well too. If you have the same entity

responsible for, you know, cradle to grave, what are the potential vulnerabilities that you could get into with that.

And then with regards to the other point about accountability, the simple straight forward answer is this, right. If we're talking about a licensed operator plant, the ultimate accountability for what's going on there could generally fall in one of two places. It could fall on the licensed individual, the licensed operator, right. Or it could fall on the facility licensee.

And again, there are certain positions that aren't situated in the tech specs and so forth as having certain responsibilities. So they may fall against the licensee generally or there could be certain organizational individuals.

When we're talking about the certified operator facilities, because the operators themselves aren't licensed, then that type of structure you would probably be looking at either the plant generally or with individuals. It's probably going to be like a plant manager or someone with that type of authority that's spelled out in technical specifications that would have accountability.

So that would be, at least at this stage

of development of rule and guidance, that's where I would foresee that accountability falling on that certified operator plant. You probably would be targeting that to, like, a plant manager type of organizational individual.

MEMBER BLEY: I think I asked you about this at one of the most recent meetings. But two related things, one is have you gotten any feedback from INTO about this idea of certified operators? And do we have any idea whether these new, especially the smaller designs, the licensees are likely to belong to INTO?

MR. SEYMOUR: So we have not currently had any engagements with INTO directly on these matters. And again, we do have a memorandum of, you know, agreement that guides how we have those interactions with them.

We have, as a courtesy, provided them information regarding the rule language that we're working on and then, you know, upcoming opportunities for public engagement and so forth. But beyond that, we generally have to wait for them to kind of meet us in the middle on those types of interactions.

MEMBER BLEY: Kind of where I'm hanging up here, if I'm a designer, and I think I've got a

client who doesn't think they need insurance because this thing is so safe that they'll never be challenged, they might not have the motivation to join INTO. And I'm just wondering if you've heard from potential applicants anything about this or not.

Because that would give me personally a little more confidence in how this is going to work if they were almost sure they're going to go the INTO route. I mean, you still have the responsibilities people are talking about, but that's a different layer.

MR. SEYMOUR: So to my knowledge, in terms of formal correspondence that we've received that would spell that out, I don't know that we've received anything that's, you know, stated a formal intention to forego accreditation.

When we get later on in the presentation, I'll talk about our preparations that we're making should we have to do the review of the training program on the end of things.

But, you know, more broadly speaking, INTO membership and so forth, I don't have an answer other than to say that, you know, me personally, I have not seen anything that has been formally submitted to us in terms of correspondence or anything.

MEMBER BLEY: Okay. And that kind of means that if they don't go that way things that you've been willing to accept from INTO, you're going to have to be doing rather than monitoring.

MR. SEYMOUR: Yes. And we'll get to that on a later slide. And again, if it's okay with the Committee, what I'd like to do is just go ahead and I'll get through this slide and the next one which should bring us to near the end of our certified operator discussion.

Or, you know, I know you mentioned wanting to take a break. I didn't know if you wanted to take that break now or wait until we're done with that?

CHAIR PETTI: Well, keep going. Let's get through Slide 61.

MR. SEYMOUR: Okay. So another factor that we have here is, you know, we're endeavoring to create a durable rule. And by that I mean a framework that remains adequate over the decades to come. So part of that foresight, I think, requires us to account for the possibility of future advancements in safety.

And I would just pose a hypothetical that, even if we have no near term applicants that could even meet the criteria for using certified operators

because of the high bar, that doesn't mean that would continue to be the case a few years down the road. And, for example, the types of innovations, we may see the fusion reactors and so forth, because it would be a game changer. We just don't know yet.

Now, this does leave the question of how it might be simpler to instead rely upon gradations within the licensed operator process, versus having two distinct tracks for operators, as has been proposed, and as we're discussing.

And this next portion of my discussion will, I think, help shed some light on the potential advantages of having those two distinct categories. And I'll begin, before we go to the table on the next slide, I'll say that, in fact, if you could just advance the slide to 61. I'll just pull that up one. I'm going through this.

So while the framework for certified operators parallels that for licensed operators in many respects, there would still exist significantly less regulatory interface and more flexibilities within certified operator programs.

And what that would ultimately equate to would likely be a meaningful cost savings on the part of facility licensees. And those cost savings would

tend to manifest themselves more significantly during the operating phase, you know, as you got past the application into the operations.

Our experiences with current industry burden estimates that we have to do for, you know, information collection and so forth, give us insights into the types of fee-billable hours that are associated with different administrative pieces and parts of this process.

And so, you know, when we look at this table without scribing numbers to it, what I can say is that our experience tells us that this equates to money on the part of facilities.

And going through, what this table is showing is it's considering certain components of both the operator licensing and certification programs. And as discussed, the proposed license and certified operator processes parallel each other at a fundamental level. But once you get past the initial NRC review and approval that's common to both programs, a number of differences become apparent when the administrative features of those programs are considered

And just stepping through these items again and going past, you know, the initial review and

approval there, and kind of these items that are in red, kind of focus on those, while both programs would have initial examinations, for example, operator certification exams would not require the NRC to review each exam prior to administration, right. So it's one difference that we currently have that's built in there.

While both programs would have operator requirements people would have to meet in order to be eligible for the licensing or certification, and that includes medical exams, that's common between the two, certified operator programs would not require submittal of and approval by the NRC of the various forms that are associated with those applications and not certifications.

So again, a difference there where, fundamentally, something similar is happening, but there's less regulatory interface associated with it.

Both programs would have regulatory requirements for the use of simulators within operator training and examination, if certified operator programs would not require the initial approval of their simulator by the NRC. So again, you know, another difference there, that one being more towards the application phase.

Another example, both programs would have requirements associated with license or certificate termination, but only the license would require reporting to and also processing by the NRC of that termination, again, in a license context.

For certified operators there would be no equivalent of either license renewal, or the termination, you know, would be something that would be handled internally as part of the program.

Additionally, for the initial operator examinations, the waiving of the examination requirements, when that's justified by appropriate circumstances, would not require correspondence with and approval by the NRC. And that would, you know, be the case with those certification programs. For licensed operator programs, that all has to get routed through us.

And then a last point, while the licensed operator programs would retain the current, you know, status quo of having a two-year requirement for training cycles and exam periodicity, facilities with certain operators would be provided the flexibility to potentially propose longer periodicities, provided, and this is an important condition here, why they could justify and adequately support requesting that

longer periodicity.

So again, if we look at these points, you know, this is where we start to see that even though you're doing fundamentally similar things, you know, a lot of the regulatory interface, and you're talking about significant numbers of hours and so forth, and resources, what that's really being accommodated by is, you know, there's still what we envision to be a robust approval of the program that's being used to do this.

And there would still be, you know, continuing oversight thereafter, most likely in the form of an ongoing inspection program, but not the day to day, you know, kind of back and forth that you have with the License program.

MEMBER BLEY: Two or three things real quickly. Some of these, when you look at them you say, oh my God, that kind of lets things slip out of control a bit, depending on if you have somebody who is not the top of the industry's operations or somebody who is, somebody, some organization who is over confident.

But to get into using certified operators, as I recall, your safety analysis has to show you don't need human actions to survive any design basis

accident, maybe there is more, and is there an limit on consequences for things beyond a design basis?

MR. SEYMOUR: So that's a good question. When we look at the criteria to be able to use certified operators in the first place, again, we do have those two sets of criteria that we proposed.

And in both cases, right, you know, talk about consequences, right. In both case, whether you're talking about Option A or Option B, what you're pointing to are the safety criteria of Subpart B.

So, when you talk about safety criteria that have been established, in the case of Option A, right, it points to the safety criteria for design basis accidents, and also for licensing basis events. The alternative criteria points, I believe, exclusively to the design basis accident criteria.

But again, you have a direct tie to the consequences of that facility. So, if you want to justify not having licensed operators, what you're going to have to show, in part, is that the consequences associated with that facility are able to meet those criteria without human action for mitigation of events, right.

And there is more layered on top of it than that. But that's the fundamental idea is that,

if the operators aren't credited to take action, that you're still not going to exceed those consequence criteria. At least with regards to the human aspect of things.

MEMBER BLEY: Okay. And if they do go this route, although they don't have to get approval for you for this check list of things, they are still under the possibility of audits I assume, is that right?

MR. SEYMOUR: Yes. And so, what we currently envision is that there would be an inspection program associated with this. And again, I don't want to speak to that in any great detail because that's another stage of built beyond where we're at right now.

But what we've been crafting into the rule are record retention requirements. You know, touch points where the NRC has to be given the opportunity presence and so forth. Even within the certified operator context.

Such that what we've currently envision is that we would have the ability to come in and watch a certification event. You know, to sample that for inspection purposes. That we would be coming in and doing the continued training inspections. You know,

very similarly to what we do with operator licensing.

In the event that a facility wasn't accredited, that they didn't have an accredited training program, we would be going deeper than that because it would actually be digging a lot more into the mechanics of how the training program was functioning and so forth.

But again, to summarize, yes, we do see, we do see that this would be a closely overseen process. But the difference is, what we would be focusing on is that a satisfactory process is being used to make this happen by being the entity that's actually doing the true certification of a post.

MEMBER BLEY: Okay. And I would just say, I think probably for some of my colleagues on the committee, and probably for some elements of the public who will watch this, the structure of an inspection program are going to be pretty important to gaining confidence that this thing is going to work.

MEMBER HALNON: And they're probably would not be, more than likely, a full-time resident inspector at many of these places. So you have to factor that in, that these would be periodic inspections, not continuous like we have now.

MEMBER BIER: Yes. One other comment with

regard to renewals and terminations, obviously plants have a very strict fitness for duty requirement, as far as like drug and alcohol abuse or whatever.

But you can also just get other mental health or cognitive decline kind of issues that you would want to make sure that they get caught eventually.

MEMBER BLEY: Have you looked at, and I'm sure you have in the past, in how the U.K. does its regulation?

One of the key things they have is that there is a group of, I'll call them inspectors, a group of people who have a warrant from the government that says, if I show up at your door, you got to open the door and I can look at anything I want.

And, it goes further there. If I find something I think is unsafe, I can actually shut you down. These things that are kind of riding with much less oversight than we're used to, I'm hypothesizing, things we saw with air systems in the past is, even though you had a design people kept modifying things.

And some kind of modifications might change the safety analysis here. But that ability to just walk in the door and see what's going on, might be the kind of thing that can also lend credibility to

this process.

MR. DENNIS: And we all, this is Bill Dennis, we always have that. We always have unfettered access.

MR. SEYMOUR: Yes, I appreciate that clarification, Bill, because that's what I was going to point to as well.

If I could, if we can just go on to Slide 62. I just want to go through these points. This is the final thing that I have in the certified operator discussion.

But again, this kind of touches upon some things that we've been talking about. I think this may kind of add to some of the questions that are currently pending.

So, some specific items that the committee raised, and to speak to those points, and I appreciate providing, there were a lot of specifics there so I appreciate that.

So, certified operators, right, again, they would be trained to conduct reactivity manipulations. We've talked about that aspect of it. But due to their unlicensed natured, a consequence of that is the facility licensee would retain ultimate accountability for operations.

And again, just to highlight that point that there is another layer to that as well. And that really has to do with the organizational responsibilities.

So, again, the answer that I current provide to that question is that we would still see that there would be an individual, probably in the order of like a plant manager that would have that type of organizational responsibility.

And the other thing I point out too, when we're talking about unfettered access, which is kind of a higher level work principle.

Another thing too is that when we talk about accountability and so forth, when we're talking about individual enforcement actions, by and large, if we're going to take enforcement action against an individual, a lot of times we're thinking about licensed operators. But if we're talking about willful misconduct, we'll take enforcement action against, routinely, people who aren't licensed.

And so, again, something to keep in mind is if you end up with a rogue certified operator that, operating outside of these approved regulated processes that we have established for a facility licensee, we still have every ability to go in there

and take individual enforcement action against them. Particularly in that willful conduct type of situation. Willfulness conduct I should say.

And we've got a track record of doing that when it's been appropriate. And again, we're talking about like wrongdoing types of situations.

MEMBER HALNON: Jesse, that comment spawned from the section on condition of licenses where the licensed operator were specifically called out that you must comply with any other conditions the Commission may impose to protect the health and safety of the public. That same provision is not in the certified operator conditions.

So, there is just a delta between not owning the license, having a license, but also in the way the regulation calls out personnel accountability of the operators. Certified operators you take credit for all the other regulations and requirements, but for the license you specifically call it out. So that was where that comment got spawned from.

MR. SEYMOUR: I appreciate the clarification. And it's a good point. When you're talking about these individuals, again, we're still a licensing facility. There is a point where if they stray too far outside of the facility's processes then

they're on their own. Again, those willful misconduct type situations.

But by and large, you do end up with a situation where the enforcement actions start being directed against the facility, vice the individual, because you will act that type of a condition that's based on a license that is held individually.

MEMBER HALNON: Right. And again, just the language somewhat diminishes the accountability, or that's maybe not the right word, but certainly dilutes it. Having the same words in the certified operator would be powerful.

MR. SEYMOUR: Yes. Yes, and I appreciate that. And again, this last point, and I appreciate the patience in kind of getting to this point, this question came up earlier and I said, well, a point later on to address it.

But this really gets to, what happens if we get to the finish line on this and we still have training for certified operators and a plant gets licensed with a facility licensed use certified operators and later on it comes to light that there is some issue that calls that into question to where it would no longer have been sufficient to license that plant with certified operators.

Now there is a, and some sort of accredited human role and safety to where licensed operators would call for.

So, something to, I guess put out there as a hypothetical is, let's say that they have this plant, they meet these criteria of 53.755(b), and we find out, you know, once the plant is up and running that a safety issue exists. If that happens, right, at a very high level, and this isn't the cleanest of answers, but at the very highest level the NRC would have, if a safety issue truly exists, right, to where reasonable assurance no longer exists within that context, then the NRC would have authority to take action.

And that could include modifying the facility's license to impose additional conditions, issuing an order, things of that nature. Within the context of such a situation, what I want to emphasize is that accrediting human actions for safety, which would be a most likely driver of why this would be called up, called into question in the first place, this potential shift to licensed operators, that's only one possible outcome of how such a safety issue might be resolved.

It's quite possible that, and I'll give

this example, that the facility licensee could elect to make changes to plant equipment instead. And in so doing, address the issue via means that obviates that need for alliance on human action to address the issue.

So, again, we say here's this safety concern that exists, and how do you address that safety concern. There may be more than one way to address it.

In the end, it's going to be incumbent on the licensee to figure out how they want to address it. Unless we tell them that it has to be a certain way.

But what I want to keep in mind is that if we're talking about something that just suddenly created a human action that needs to be taken to mitigate an accident, then perhaps there is an equipment change or something else to be made in the facility that would obviate the need for that.

So, again, that's one possible outcome that could be there. It's a complex issue.

Ultimately, if there is no other recourse than the imposition of the requirement for licensed operators, than what we expect is that the parallelism that exists between the licensed and certified

operator programs, would tend to make such a transition a viable possibility to converting a licensed, a certified program to a licensed program.

Although still, and again, this isn't a clean, neat answer. The interim state plan operations, if that plant was allowed to continue operating pending that, it would be something that we'd have to very careful consider and perhaps condition as necessary to give us that assurance.

So, again, not a neat, clean answer, but again, I just wanted to go through and explain the mechanics that are there.

And with that being said, the next slide will take us into the simulator discussion, so I didn't know if there were further questions or if we wanted to break.

CHAIR PETTI: Let's break. So, why don't we break and return at 40 minutes after the hour.

(Whereupon, the above-entitled matter went off the record at 4:22 p.m. and resumed at 4:40 p.m.)

CHAIR PETTI: Okay, welcome back everyone. Let's continue. Jesse, the floor is yours.

MR. SEYMOUR: Well thank you, I appreciate it. Okay, so here we are on Slide 63. I appreciate that.

So, now to transition to the topic of simulator scope. And again, after this we'll stop at training topics so, I know we're getting near the end of time, but there is too much further to go.

As before, I'd like to provide a quick review of what's presently being proposed, and then we'll get into the specific questions that the Committee had.

So 53.765(e) establishes simulation facility requirements for plants required to have licensed operator staffing, while 53.773(e) separately establishes less stringent simulation facility requirements for plant and certified operators.

Key aspects of both though, whether licensed or certified, include the following. And I'll point out where there's a difference here.

The full-scope simulators are not mandated, and partial-scope simulators may be acceptable providing that the scope is adequate to meet the intended usage. Alternative simulators usage are possible as well.

Simulation facilities for plants with licensed operators would need to be approved by the Commission if the facility for licensee would be relying upon them for training, experience

requirements or for initial order of qualification examinations.

Likewise though, or I should say separately, similar approval would not be required for the certified operator facilities. That's not to say there wouldn't be regulatory requirements that they would have to meet, and those will be enforceable.

But again, that would fall more on the ongoing inspection and maintenance of the facility thereafter, not necessarily the initial approval. Such would be the case with a licensed operator program.

And then the last point, facilities must demonstrate that the accurate simulator scope is provided to support human factors engineering analyses and assessments in order to use that simulation facility for conducting those analyses or assessments.

So again, for the intended usage, you know, going to support your staffing plan by doing staffing plan analyses on a simulator. And one of the things that you have to be able to do is reproduce the required situations of input to the crew and workload and tasking. Then that would be another driver that would require an adequate simulator scope.

So again, I just want to highlight what we

have current proposed, but I'm going to talk more about these points on the next slide and really going to dig into the details.

We're going to move on to Slide 64. Okay. So now, how did we get to proposing awarding of the applicant. In developing the preliminary rule language, we start by reviewing Section 306 of the Nuclear Waste Policy Act, as well as the 52 Federal Register 9453.

And what the references, it's from 1987 as I recall. And I believe that was when the Commission was first taking the simulator relayed wording of Nuclear Waste Policy Act and turning that into regulations.

So, again some of the underlying thinking is embedded in those statements of consideration. At least at the time when we first implemented this.

One key observation was that flexibilities were historically provided to allow for the potential use of a plant itself. And/or a plant reference simulator.

Or perhaps some other type of simulation device. And examples that were called up back then were part task or even a basic principles simulator. And using one or various combinations of those for the

conduct of the simulator portion of the operating task.

Another key observation was that the NRC stated intents at that point, had been to not permit the initiation of transients on the plant itself if the plant was going to be used as a simulation facility, rather the use of plant was envisioned as an option that might be used in conjunction with another simulation device, or devices, in lieu of a plant referenced simulator.

So again, we look back at those historical treatments that the agency made as it interpreted the Nuclear Waste Policy Act and formulated its simulator based requirements.

And the current perspective that we came away with from that is that the Nuclear Waste Policy Act, and what's required of us, what it's mandating is not necessarily that we establishment requirements for the plants that have simulators per say, but rather that it's requiring us to establish regulations that address the use of simulations in training. And I know it's kind of parsing up the words, but there is a distinction to be more there.

And what that does is it gives us, whether we elect to use it or not, but it gives us flexibility

to allow the use of the actual plant to simulate tasks for training, and operating task purposes, without having a separate simulation facility.

And to give an example of this, Part 50, I should say Part 55, covers the non-power reactors as well. And the research of test reactors do not have simulators generally, right, so, how are they able to do that.

And it was actually through this track they were essentially grand fathered and allowed to use their actual facility as a simulation facility. So, again, I think that provides some historic concepts. And we use that to shape some of our thinking as we went through this.

If we can move up to the next slide please. Okay. So the philosophical basis behind the preliminary rule language is that overall the staff feel that, and again, I can't overstate this, the staff feel that plant reference full-scope simulators remain the preferred approach and would represent the best route for meeting Part 53 requirements. I think that is undeniable.

Even with the flexibilities that have preliminary afforded, we still expect the majority of Part 53 applicants would go that route. And by that

I mean, having full-scope plant referenced simulators.

Because what it would give is a high degree of regulatory certainty. And also, something to keep in mind too is, with technological advances, the costs, we envision the costs coming down to build these types of facilities.

If you're familiar with the legacy plants that are out there where you have hard simulators and you'll have a large chunk of the training building dedicated to replicating all of the switches and meters and panels and so forth, and the upkeep that's required because of those physical devices and so forth.

And then you look at, for example, like an AP1000 or like a NuScale or new designers where you're talking about having digital displays used far more extensively, and you kind of plot that on a trend line, what you'll see is that the future designs, by and large, when they build simulator in the control room it's going to be very heavy most likely. And the use of soft controls, right. You know, glass top type simulation displays and so forth.

And so, you're not having to go and actually install all the micro-switches and meters and so on and so forth to replicate that. So, we see the

cost burden coming down from having that. At the same time too, you'll, you know, a higher regulatory certainty for doing that.

And as a point of comparison, to be fair, the existing regulations that we have now at 55.46 do not strictly mandate plant referenced full-scope simulators either. Because of how we allow for the alternative of having a commissioned approved simulator.

And in theory someone could, in theory, come through that commission approved route and end up with something coming out of it that isn't necessarily a plant referenced full-scope simulator. But with that being said, we still see that full-scope plant referenced simulators were adopted, universally, by the current power reactors that are out there in the fleet.

So again, just to clarify that even with flexibilities that, in our mind, really don't extend beyond what historically has been envisioned. We think that the clearly preferable route is going to remain in the normal remaining plant referenced full-scope simulators.

The Part 53 rule language use alternatives of simulator usage. You know, whether they be full-

scope or otherwise. But the important thing is that the burden would be on the applicant to demonstrate how a number of areas are supported.

So if they want to go with the route of using maybe a partial-scope simulator augmented by using the facility itself for certain portions of their approach, they will have to demonstrate how they're going to accomplish these areas in an acceptable manner.

And that would include their licensed or certified operator training in exams, the simulators that they're going to use. If they're using a partial-scope simulator would have to have sufficient scope and fidelity for operators to acquire and demonstrate knowledge and abilities, via for the job duties. So that would place constraints on how minimal that scope could be.

Additional experience requirements. So very important. If you want to get individuals licensed before you've actually constructed the facility, we don't envision that being off of the requirements mandate experience of conducting reactivity manipulations.

So however you're going to do that, if you don't have a plant that's been constructed, well,

you're going to use a simulator. And again, we can follow that logic through to impose those types of requirements.

And then lastly, human factors engineering analyses and assessments. And the associated human system interface design test spec needs for facility would need to be counted for as well too.

And granite, there are various HFE technics that could be used to potentially find ways to get around a simulator. Most likely if you're talking about a very small micro-reactor facility.

Perhaps you're going to, and again, just examples, perhaps you're going to use things like mock-ups, table tops, walkthroughs, that type of thing. But again, the burden would be on the Applicant to show how they're able to do that in an acceptable way.

And these, you know, getting to one of the points that the Committee raised in the written questions that I received, these considerations extend to accident analyses and transient analysis considerations as well too. And to clarify, I'm making a distinction here between pure computer modeling and simulation facilities. So, keeping in mind that there is a distinction there.

But that said, if an applicant chooses to means rather than a full-scope plant referenced simulator to support their safety case, then the burden is going to rest on them to do so using different means and to be able to show how they're able to cobble that together in an acceptable problem.

That's what information that I have prepared for the simulator discussions. But I'd just like to pause and deal with any questions.

MEMBER HALNON: So, Jesse, I assume that, I think one of the issues that we were talking earlier on the last meeting was just, the approval process for partial-scope simulators for specific reasons.

Does the staff have any experience in approving the use of those?

I know that there is, it's not too far behind specific models and how they might approve those, but is there a thought process on how you would go about approving maybe a partial simulator?

MR. SEYMOUR: And so, within the framework of the existing 55.46 there are elements of that, that would send a guide, you know, send a data approach there. And in general, things that we glean from that are, we would want to see descriptions of how that would play out, how things would be supported, what

would be represented by the partial-scope simulator.

We would also want to see the performance testing associated with that. What the plans are for that testing and so forth.

And again, I don't have 55.46 in front of me, but there are aspects of how you would go through the Commission approved simulator process that would have lend themselves to that type of approach.

In terms of any recent experiences with doing a partial-scope simulator, I can't speak to anything that's been done recently that was of that nature. What we do have are Commission approved simulator circumstances. But that was more in like an instruction environment.

So in terms of anything different than kind of the end thought being a full scale plant referenced simulator, I can't say that we have that outside of, really our experiences with the RTRs.

And with the RTRs, again, really what they're doing there is they're using the plants as a, the facility I should say, not the plant. But they're using the facility as a simulation facility.

And they're structuring, you know, they're operating tests around having to either do hands on evolutions, perhaps for reactivity and so forth, or

having to do what we call job performance measures. And having ones that are a bit more integrated. You know, to where you're kind of walking through that response and so forth.

MEMBER HALNON: Yes.

MR. SEYMOUR: To my understanding. And again, that's a little bit outside my area of expertise.

MEMBER HALNON: Okay. 50.34 and the addition TAI step talks about a simulator. Does that, does the fact that we have full-scope simulators --

(Audio interference.)

MR. SEYMOUR: I think your audio dropped out, I apologize.

MEMBER HALNON: Oops, I'm sorry. Yes, I touched the wrong mute button.

50.34 has some discussion of simulators and post-TAI, or additional TAI, requirements. Did you guys look at that delta here and determine that it wasn't necessary or, I guess go back to the issue at hand, is the simplicity of things expected to be such that you don't need to worry about the post-TAI requirements?

MR. SEYMOUR: So we did an analysis for post-TAI requirements when we brought them over.

Again, there is a few data points that we looked at in crafting some of the requirements.

There's been an analysis that was done by, actually, by Bill and some of this counterparts, that involved looking at regulatory applicability for non-light water reactors. And there was a treatment of post-TAI requirements that was embedded in that.

MEMBER HALNON: Okay.

MR. SEYMOUR: So, we did look at that. And to my recollection, I think that there had been an analysis of, consideration of that particular requirement within there. My memory is a bit rusty on that point.

MEMBER HALNON: Yes.

MR. SEYMOUR: But one of the things that we did in the course of developing this is we did import over a number of post-TAI requirements. And again, we did a lot of changes there.

One of the things that we did is we said that the simulator requirements that we would place here, in our perspective, would tend to be covered, right. So the simulator requirement that we would have here would tend to cover the post-TAI requirement.

Now, what that leaves though is the

possibility that someone could go through and they would make a justification to say, well, I can accomplish all these things just using my plants, and perhaps a partial-scope simulator. And where does that leave the underlying post-TAI requirements via the mindset.

And I think, and again, I don't have that regulation in front of me, but to my mind set I think one of the things that was required in there was the ability to model of loss of coolant accidents, for example, in the post-TAI requirements.

So again, what you're talking about there is the ability of those operators to train in the response to those events, right?

MEMBER HALNON: Right.

MR. SEYMOUR: When we look at the training and examination requirements, one of the things that we're establishing is that, especially for the examination requirements, right, because that's where you start seeing the link to the operating test of how you're doing the operating test and how you're accomplishing that.

One of the things that has to be accounted for is the demonstration of these knowledge and abilities that are needed to maintain plant safety

functions. So, in order to make the case that I can do an operating test and you continuing training for these operators, without having this full-scope simulator that maybe models like this loss of coolant accident, or that situation, again, the burden would be on the applicant to show how they're going to be able to test on the knowledge and abilities needed to maintain plant safety functions, right. And then part of my core cooling there, right, and how they're able to accomplish that with something short of a full-scope simulator.

So when we look at, again, this is a place where it's kind of a web of regulation and so forth, but when we look at how they interact with one another and how they kind of tie in and balance one another out. We said, if that situation were to arise, then there would be a hurdle here that would have to be cleared. There would be an interlock in the process.

MEMBER HALNON: Yes. Well, when I first saw this I was kind of taken aside by it. But after I thought about it some more with the boundaries you've put on it and the fact that it's got to be justified in a couple of different ways, I became okay with it.

I think the guidance that you put out for

approving partial-scope should have some, at least some minimum standards that you would look to, to make sure that what we've learned up to this point, with the large light water stuff, that we don't lose that. Like, the human factors, the alarm locations, the ability to multitask and those types of things.

So, I'm okay with this. I think that, again, some of the details was down the road. And most people will probably, like you say, go to the full-scope, just so they can get through the training process and initial proving of the technology and the ability to operate it.

MR. SEYMOUR: Thank you. I appreciate that. And I capture a note regarding the guidance content. I appreciate that feedback.

MEMBER KIRCHNER: And then, Jesse, then the, this is Walt, would the intention then be to essentially lift the functional requirements so to speak out of 55.46?

MR. SEYMOUR: So, the wording that we current have in the preliminary rule language, it used 55.46 as a starting point. And what we did is we took the Part 50.52, lessons learned rulemaking, that's ongoing. We took some improvements to the language that are being considered for there, and we took the

55.46 language and we used that.

So in terms of what does a simulator need to be able to do in terms of performance testing and what does that need to be able to demonstrate. There are requirements that are embedded in there. And again, for the specifics I will actually have to pull those up and take a look.

But again, I can talk a little bit more about what that actually reads like. But yes, we still do maintain performance testing requirements.

And again, record retention. The ability for us to come in and look at that and certify that it's being done in an acceptable way.

MEMBER KIRCHNER: Thank you.

MR. SEYMOUR: Were there any other questions regarding simulator? The last topic is training, so if there I no further questions I'll move into that.

And actually, before I do though, just to read. Some of the wording that we actually have built in for simulator testing requirements. And I'll just skim through these real quick.

What we say is that the simulator must be of sufficient scope and fidelity for individuals to require and demonstrate the necessary knowledge and

skills and abilities to safely perform licensed operator and senior licensed operator duties.

The simulator must utilize models relating to nuclear and thermal hydraulics to replicate the most recent core load, or the intended core load if you're under construction.

And then in terms of performance testing, again, there are requirements associated with that. So we want to maintain that ability to come and look at things. So, we have a section on continue assurance of simulator fidelity.

So, facility licensees that maintain a similar facility have to meet certain requirements. So that includes conducting performance testing throughout the life of the simulation facility.

And what we do is we say the results of those performance tests must be retained for four years, right. Which is derived from 55.46. Or until superseded.

And also, we build in that they, you know, there is a need to promptly correct modeling and hardware discrepancies and so forth. So, again, we do also make that link kind of similar to how 55.46 currently does.

Okay. Yes, so we can move on to the next

slide, which should be on training. Okay.

And so, what I'm going to do is, just very quickly I'm just going to recap the places where SAT-based training comes into play with Part 53. And what this will do is highlight the need for why we have this guidance. And then I'll go through what we plan to do with it.

So, as a recap, 53.765(a) requires initial licensed operator training programs to be based upon a systems approach to training. And that be approved by the Commission requiring the use. That's also the case with pre-qualification training as well for licensed operators.

And if we can move on to the next slide. Okay. So for certified operators we have something similar in that we would require that the initial training program for certified operators be based upon the systems approach to training. And also approved by the Commission.

And then likewise, we would have similar requirements for their continuing training as well. So again, both of those, for licensed and certified operators would be reliant upon a systems approached training.

And then additionally, for other

categorized plant personnel, so this is our equivalence of the 51.20 training rule, we would have specific training qualification requirements there as well that are articulated.

And really what that amounts to is that there is other categories where personnel decides licensed and certified operators also have to have a SAT-based training program.

So if we move on to the next slide, we'll talk about the implications of this slide because we mentioned earlier in our discussion about what happens if a plant decides to forego a training program with accreditation. They choose not to join INTO, whatever the case may be.

So as we saw, there is a broader reliance upon SAT-based training programs within 53, that's where we currently have it, preliminarily written, with some programs needing initial approval by the NRC and others may be not needing the initial approval, but needing the means of ongoing verification of their, you know, applying the SAT process in an acceptable way.

So while at present, training program accreditation can serve as a means of meeting those requirements. And the same thing, comparable manner

to how it does under Parts 50 and 55.

We recognize a possibility that some applicants may elect to forego accreditation of their training programs. So, under that type of circumstance, what that would necessitate the NRC Staff to do, is to directly determine the acceptability or proposed training programs.

It would require us to assess the ongoing conformance of facility licensee training programs with applicable regulatory requirements. And also, to conduct inspections of those other training programs with other personnel. And by that, technicians, equipment operators, right, those types of individuals.

So for these reasons, the Staff will need guidance to support making those types of determinations. And specifically, regarding whether a systems approach training is being adequately applied.

However, and this was, I think alluded to in the Committee's questions, and we discussed this during the last meeting as well, existing guidance. Which is something that we are cognizant of, existing guidance is primarily NUREG-1220. That document is dated. And update to it is warranted.

So what are we doing to address that? So, a working group that is comprised of individuals with a good mix of operator licensing and commercial training experience has been established to develop that guidance.

And our objective is to develop guidance that can kind of seamlessly tackle either looking at training within in an initial training context or the initial review and approval of a program, or going in on an ongoing basis looking at that program. So again, something that down the road can lend itself to an inspection program if so needed.

So basically, how do you look at that program to make sure that it was set up correctly initially, and then how do you look at it to make sure that it's functioning once it's up and running. And our current objective is to have interim staff guidance developed no later than 2024 to support the Part 52 rulemaking.

However, we are actively working to accelerate development of that guidance in order to support near-term applicants that may come in under Parts 50 and 52, should that prove to be necessary.

Again, it's one of those things that could happen at any time. Even in the existing fleet. It's

theoretically possible that INTO could withdraw their accreditation of a training program.

And if that were to happen, then we would have to directly go in and inspect that. So, the underlying idea that that could happen is something that does exist in the present day.

But we recognize that an advance reactor could come in under Part 50 and 52 and request to do this. And so, for that reason we're working on a more aggressive timeline in 2024 to try to have that ready as a goal. But in any case, no later than 2024 to support the rulemaking.

And most likely, the guidance would initially be used in the form of an NRC Staff guidance document that would be part of ARCAP. And again, down the road its permanent home could potentially be a NUREG. The same thing as NUREG-1220.

So, again, I'm not sure if that answers the question from the Committee that I was provided or if there is more discussion that we'd like to --

MEMBER HALNON: No, that answers it, Jesse. We were interested in what your plans were to update those documents. Since we talked about last time relying on some of the data guidance in those.

MR. SEYMOUR: Okay. Well, if we want to

go on to Slide 69. That's the end of the prepared portion of my presentation, so I just wanted to go ahead and open things up and see if there was any further questions or general discussion.

MEMBER BROWN: Yes. This is Charlie Brown. Can you go back to your other slides for a second? 68.

I'm trying to understand. I've got a bullet that says that applicants don't have to have a training program accreditation. I presume that's by the NRC?

MEMBER HALNON: It's INTO.

MR. SEYMOUR: Yes, so training program accreditation is, that happens through the National Academy of Nuclear Training. But our stance on that is that it's one acceptable way to meet certain training requirements.

So, again, it's not mandatory and it's not something that we do, we just, we look at that through our memorandum of understanding with INTO as being an acceptable way.

MEMBER BALLINGER: This is Ron. I look at that --

(Simultaneous speaking.)

MEMBER BROWN: Ron? Ron? Ron, hold on,

let me finish. But you followed up with another bullet that talks about determining whether the SAT is adequately applied. Are those two different thoughts, they don't apply to each other?

MR. SEYMOUR: So, as part of that training accreditation would be, part of that process would entail making sure that the SAT process is being applied, right. So again --

MEMBER BROWN: And that's for INTO as well?

MR. SEYMOUR: Well, again, if we treat their process as being a package, if you will, one of the things that falls within that package would be making sure that the facility is implementing a SAT-based training process.

MEMBER BROWN: Right.

MR. SEYMOUR: So we look at it that if INTO maintains the accreditation of that plant, that those requirements would be met through that means. And that's how we perceived that.

Now, if INTO goes and withdraws their accreditation from a facility, now we have to go in and directly determine that. So INTO withdrawing their accreditation would not necessarily, it doesn't automatically mean that a plant is not meeting the

regulation, what it means is that we need to directly determine whether or not the regulations are being met.

So that's currently the mechanism that we work through.

MEMBER BROWN: I got out of the first two slides that you all provide the accreditation with those first, from Slide 66 and 67, and then you pop over to 68 where now we go to INTO as the certifier, or the accreditor?

And then the second bullet, I'm still lost on who is who in the zoo here. Does INTO do all of the accreditation or are you all actively involved in the accreditations under the, what your comments were on Slides 66 and 67?

MR. SEYMOUR: So we have. We, as the NRC, have nothing that correlates to an accreditation process. For us everything is based on the evaluation if you meet the regulations or not.

But similar to how we will issue a regulatory guide that shows an acceptable way of meeting the regulation, it's kind of a comparable analogy that you can use with the training program accreditation, right?

There's an outside entity run through

INTO. The National Academy of Nuclear Training. And they have a training accreditation process.

And what we've done in the matter of what's comparable to how we would think about our reg guide type of processes which said, if you're using that accreditation process, then there is certain training program requirements that we'll say that you're meeting through an acceptable way.

And so, when I refer on the earlier slides to, you know, we would need to look at, review the training program and make sure that they're defined SAT, and things of that nature, that's akin to what the regulation says. What --

MEMBER BROWN: Jesse, I'm still lost. I'm really sorry to be obtuse, okay.

Slide 66 requires initial licensed operator programs to be based on, and then you go through a litany. And facilities establish a pre-qualification goes through a litany. Are those done by NRC or by INTO?

MR. SEYMOUR: So, at a high level those are done by NRC where the INTO accreditation training, you know, where those points really come to play is this. When you get to specific aspects of how those things are being met as we go from, we look at things,

there is certain points that you can reach within that process where you'd say, how are they meeting this aspect of it, right? And accreditation would be an acceptable way to meet that.

So, again, if we get to a point in that process where the question that we're asking is, are they implementing a SAT-based training program and we see that they're going to achieve accreditation, you know, their training process, then we would say, okay, that piece is met.

There is other pieces to that that we would still need to look at. So again, it's kind of a total, kind of a total picture where accreditation forms an acceptable way to meet certain requirements that are there.

But as part of the initial review, we need to look at all the requirements to see that, one way or another, there is some means that's being used to mean all of those.

MEMBER BROWN: I am totally lost. I'm just trying to figure out who puts the Betty Crocker Seal of Approval and stamp on their foreheads.

MEMBER HALNON: So, Charlie, this is Greg, let me see if I can help. You got two choices in your training program.

You're a member of INTO and you get your program accredited through the academy, which is INTO.

MEMBER BROWN: Okay.

MEMBER HALNON: The NRC doesn't inspect your training program.

MEMBER BROWN: That's what I was asking. So INTO can be the surrogate for the Betty Crocker, Good Housekeeping Seal of Approval?

MEMBER HALNON: In essence, to a degree, yes. But not necessarily. You know, the exam process and the licensing process still is oversaw by NRC, like we've already talked about.

So if you don't have that academy accreditation, much like the college accreditation, then you have to have your program inspected by the NRC. And that inspection will determine whether or not it is adequate to get into a licensing situation.

MEMBER BROWN: Okay.

MEMBER HALNON: That's choice number two. So all the light water --

(Simultaneous speaking.)

MEMBER BROWN: Go ahead.

MEMBER HALNON: Yes. The light water plants are all accredited.

MEMBER BROWN: So if INTO, if they don't

have an accreditation from INTO, what, oh no, let me start over again.

If they have an accreditation for INTO, does that release NRC from doing anything?

MEMBER HALNON: Well not anything, but yes, from the inspection that determines whether or not the training program is adequate, yes. But they don't have to do the inspection for that.

MEMBER BROWN: Okay. So they rely on INTO in that case?

MEMBER HALNON: Correct.

MEMBER SUNSERI: Well, there's still, excuse me, Greg, but there is still an NRC inspection periodically done on the recall program. There is still an inspection by NRC done on the simulator fidelity.

So, the NRC does not wash their hands of the training program just because it's accredited, there is several tentacles into, and a lot of oversight.

MEMBER HALNON: Yes, they still have oversight, inspection oversight, but the adequacy of the program, initially is, and there's an inspection procedure, 41500, that they don't have to do. Which is the one that says, if the program meets 10 CFR 55.

MR. SEYMOUR: I appreciate the summary of kind of the touch points that we have. Even with that memorandum of understanding it's important to keep in mind that we didn't just give up the farm, right.

What we do is, we still have certain touch points. We still come in independently and administer the initial licensing examinations. We still come out periodically and conduct inspections of the re-qualification training program which doesn't need --

MEMBER BROWN: I think --

MR. SEYMOUR: -- simulator inspection.

MR. SEYMOUR: I think you're back onto the table. So the licensed operators. I was thinking about to the table, that's what I'm trying to understand.

The table showed you all really being, doing all that licensing process in that left-hand column. For the licensed operators.

Because, yes, Slide 61. So there you all are all involved, and the accreditation is a separate piece.

MR. SEYMOUR: That's right. When you look at that very first block that's up there and, you know, you see where it says, NRC approval training and examination programs.

MEMBER BROWN: Yes.

MR. SEYMOUR: Where for both of these we're coming in and we're doing that. Accreditation could form part of the pie for how that initial --

MEMBER BROWN: Okay. I'm good, Jesse. I just, I've got a better, I understand. It just seemed to be a disconnect to me.

I understand what you're saying. And thanks to Greg and Matt's input also. So thanks. I'll stop now.

MR. SEYMOUR: Thank you.

MEMBER HALNON: So then, Jesse, that did bring up another question. That ISG, I assume, will follow through with an inspection procedure. 41500 is pretty dated as well.

MR. SEYMOUR: Yes. And that's one of our thought processes again with, when we think about what is the inspection program going to look like for these reactors, I mean, that's another developmental stage down the road. But, again, we're thinking towards that.

And one thing that we've already mapped out is that our guidance should direct a multi-tool that can be used within that application as well too.

So again, when you think about those touch

points that we still maintain with training, one of them is performance based. So if there is significant events that happen at a plant, we still have the ability to come in and, irrespective of whether that training program is accredited, it's like thinking about opening up the hood on the car, you know. We can still come in there and pop the hood and start looking, doing like a deep dive, into aspects of the training program.

And that's really what 41500 lets us do. So, in part of maintaining that toolkit we want to make sure that our guidance is also suitable to that type of application as well.

Should we have to come in, you know. Again, the plant may have accreditation, but if there are significant plant events that are happening and we think there's a training nexus, we need to maintain that capability. Go in their independently, look at it ourselves and see if we think that the SAT process is being applied.

Where there other questions on anything or, again, I was at the end of the prepared portion.

CHAIR PETTI: Members, any other comments?

Okay. Well, let's turn to public input. If there is any member of the public that would like

to make a comment, *6 to unmute yourself. State your name and make your comment.

Okay, not hearing any, I see a hand raised. Dennis, do you want to make a comment?

MR. HENNEKE: Yes, I do.

CHAIR PETTI: Okay. Go ahead.

MR. HENNEKE: Yes, this is Dennis Henneke with GE Hitachi. I'm a senior probabilistic risk assessment engineer here at GE Hitachi working on versatile test reactor and interim PRAs, as well as ATRIUM.

I thought the conversation on the certified versus licensed operator got a little off track and I just wanted to bring it back to what I think the Staff was presenting in the beginning.

The reason for the simplified approached for licensees is that many of the advance reactors, like our southern reactors that we're analyzing, show that the PRA had found no risk significant or safety significant operator actions. And the differentiation being, risk significant being a significant contributor to overall risk and the safety significant being defense actions.

And so we have people who have determined walkaway safe plants wherein the operator really

doesn't perform the safety function. It's not to say the operator won't be doing anything.

Our reactor has a molten salt primary with an ATRIUM reactor with a secondary assigned with molten salt storage. And it gets to be a complicated operation of the balance of plant side, but again, no safety implication for the operator with regard to post-accident actions.

So if you were to setup a training program or setup emergency procedures. The thought of risk informed guidance is they really, there's not much to put into those that are required in order to meet the safety goals.

So, the simplified approach is perfect for a risk informed approach where we can reduce burden where needed based on the overall risk. And if a plant doesn't, has operator action that are required for safety then they wouldn't be able to go down that pathway with a certified operator.

So, I just want to clarify, we see a very positive role in this process. And the reason is because of the limited importance of post-initiator operator actions. So appreciate it.

MEMBER BROWN: Of course, that assumes that everything you all have calculated and then

analyzed is actually correct and there are no unknown unknowns.

MR. HENNEKE: I think that's true with existing reactors and existing --

MEMBER BROWN: Yes, but they have been in operation for 50 or 60 years so there's a lot more of those hidden unknowns have been eliminated. That's the only point.

MEMBER HALNON: I would make one other point that I've seen a lot of exam failures for NRC licenses on the secondary side being complicated, so that's just one data point that I have in my head.

MR. SEYMOUR: It's a very interesting discussion, and it's one that's very complex. There is a commenter, you know, what we were trying to capture with our thinking was thinking through those types of changes, general role and so forth.

But again, the point that was also made about secondary plant initiators and the types of complexities that you can see, you know, it's complicated, right. If we think about Three Mile Island, where did Three Mile Island begin.

I mean, the ultimate initiator, as I remember the operating experience, really came from honestly polishing. I think there is a perturbation

there that kind of kick started everything. And the other is a chain of dominos.

But really we're talking about something that began all the way over on, you know, a part of the secondary we really don't think about that often. And propagate it, propagate it from there.

So again, something that, I think irrespective of whatever the end state is of a proposed rule when we finally solidify it, something that we're definitely sensitive to on our end is that if there is an allowed outcome where the individuals aren't licensed, the safety criteria needs to be robust to get there.

So, again, that's not something that we treat lightly. Kind of irrespective of where we end up just even entertaining that possibility, it's a high bar in our eyes.

CHAIR PETTI: Okay. Any other comments from members of the public?

MEMBER REMPE: And, Dave --

CHAIR PETTI: Yes.

MEMBER REMPE: -- I'd like to remind all of us that these are just comments from members of the public, even though we know Dennis and whoever else maybe is speaking, but we don't usually engage like I

just heard with the responses to members of the public who provide comments. We appreciate them and we take them into consideration, but that's it.

MEMBER BROWN: Sorry about that, Joy.

MR. WIDMAYER: There's a hand up from Cyril Draffin.

CHAIR PETTI: Ah, okay. I didn't see that. Cyril, go ahead.

MR. DRAFFIN: Thanks. Just to kind of follow-up on what Mr. Henneke said. There is a number of companies that are also considering this. There is was a discussion on certified operators about edge cases.

And Part 53 will be, hopefully used for decades. And so these educations may be more common in the future. And so I think there is other developers that have some of the same analysis done that suggest that they may have safety that would enable some of the criteria that was being discussed today to be used.

The second point would be, we do appreciate the forward thinking about the NRC Staff thinking about our concept of operations. You know, I think a logical systemic approach for looking at that is important.

And the criteria for assessing certified operators finds a solves point for perspective applicants. The options for simulators and training programs allow tail-end of the training approach.

So, thinking through these concept operations with these new systems is appropriate, and we appreciate the discussion today.

CHAIR PETTI: Okay, thank you. Any more comments?

Okay, well, then with that I really want to thank all the presenters today. Very illuminating day. And we will see everyone tomorrow for part two of our discussions on Part 53. So we're recessed for today, and we will be back tomorrow at 9:30 Eastern Time. Thank you all.

(Whereupon, the above-entitled matter went off the record at 5:27 p.m.)

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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FRIDAY

DECEMBER 17, 2021

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The Subcommittee met via Teleconference, at 9:30 a.m. EST, David Petti, Chair, presiding.

COMMITTEE MEMBERS:

DAVID A. PETTI, Chair

RONALD G. BALLINGER, Member

VICKI M. BIER, Member

DENNIS BLEY, Member

CHARLES H. BROWN, JR. Member

VESNA B. DIMITRIJEVIC, Member

GREGORY H. HALNON, Member

WALTER L. KIRCHNER, Member

JOY L. REMPE, Member

MATTHEW W. SUNSERI, Member

DESIGNATED FEDERAL OFFICIAL:

DEREK WIDMAYER

CONTENTS

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

9:30 a.m.

CHAIR PETTI: I have 30 minutes past the hour. So we can reconvene the second day of our meeting on Part 53, and turn it over to the staff to hear about TICAP and ARCAP.

I guess there's some opening remarks, though. Is Steve going to do that or?

MR. BEALL: Hi, Dave. This is Bob Beall.

CHAIR PETTI: Oh, okay, Bob.

MR. BEALL: Yes, there's no opening remarks today. So we have our staff ready to go into the presentation.

CHAIR PETTI: Good. Let's get going then.

MR. SEBROSKY: Good morning. My name is Joe Sebrosky. I'm a Senior Project Manager in the Advanced Reactor Policy Branch in the Office of Nuclear Reactor Regulation.

And I will be presenting, along with my colleague Eric Oesterle, on the advanced reactor content of application project and the technology-inclusive content of application project, the white paper guidance documents that we've issued to date.

So can you go to the next slide, please?

The main purpose of this briefing to the

Subcommittee is to give you an overview of both the ARCAP and TICAP guidance document developments since the last Subcommittee briefing in July. And if you go back to the previous briefings, we, essentially, just outlined the structure of the ARCAP and TICAP guidance documents. For the purposes of this meeting, we hope to highlight some of the key draft white paper guidance, with particular attention to portions of the guidance that we think may be of interest to the ACRS.

On the bottom of slide 73, you see a link to where the key documents that we're going to be talking about can be found on our public web page.

Next slide, please.

So just a reminder, we provided high-level briefings on ARCAP and TICAP to the ACRS Subcommittee on March 17th and July 21st. The high-level purpose of both ARCAP and TICAP is to develop technology-inclusive, risk-informed, and performance-based application guidance.

The guidance that we're developing can be used to support a Part 50, 52, or Part 53 application. If you look at the first sub-bullet under that, you'll see that the near-term need is to develop guidance to support expected advanced reactor 50 or 52 applications using the Licensing Modernization Project

process.

One of the things that Bob Beall talked about yesterday was the overall schedule for Part 53. At a very high level, that's slipped a little bit per discussions. From our perspective, the item that is actually driving the ARCAP and TICAP schedules are the near-term construction permit applications that we expect from applicants that are going to use -- they have told us during robust pre-application meetings that they intend to use the LMP. So the driver for the schedule for ARCAP and TICAP is 50 and 52 in the near term, not Part 53.

As another reminder, TICAP, fundamentally, relies on the LMP process, which is endorsed in Reg. Guide 1.233 and references NEI 18-04.

We are targeting ARCAP and TICAP guidance for 1552, as I said, but we have an eye on Part 53 proposed rule language, and we intend to adjust the ARCAP and TICAP guidance documents as the Part 53 proposed rule language is adjusted. One of the fundamental assumptions is that Part 53 will allow the use of the LMP process to meet the underlying requirements.

Next slide, please.

MEMBER BLEY: Let me ask you a question.

It's Dennis Bley.

If you're going to be able to adapt the language, how are you planning to release these in the interim to be used for 1552? Is it going to be ISG or something?

MR. SEBROSKY: Correct. And we'll walk through that, Dennis. Right now, to solicit stakeholder interactions or to support stakeholder interactions, we've issued a guidance that we're going to be talking about today in draft white paper form, TICAP in a draft white paper Reg. Guide form and ARCAP in Interim Staff Guidance forms. So the idea is, by providing that early indication of what we're thinking, it allows us to engage stakeholders prior to formalizing the document in an ISG and asking for public comment.

MEMBER BLEY: Okay. All the things you just said will probably help with respect to Part 53, having the guidance more complete when we look at it.

So good. Go ahead.

MR. SEBROSKY: Slide 75, please.

So the next couple of slides just provide kind of a high-level background, and then, I'll talk in more detail about highlights of the ARCAP white paper Interim Staff Guidance that we've issued to

date. And then, Eric will be doing an overview of the TICAP guidance.

So this slide is just a background that the TICAP guidance is based on the LMP, the Licensing Modernization Project process. LMP, fundamentally, does three things. It provides an approach to select your licensing basis events; develop a structure system and component categorization; identifies special treatment for SSCs, and ensures defense-in-depth accuracy.

Industry is developing key portions of the TICAP guidance for NRC endorsement, and the industry's TICAP guidance will be supplemented by the NRC staff-developed guidance as necessary.

ARCAP is broader in nature than TICAP and is intended to cover guidance for small modular reactors and non-light water reactor applications for a combined license under Part 52; construction permit or operating license under Part 50; design cert, standard design approval, or manufacturing license under Part 52.

ARCAP encompasses TICAP and provides supplemental and additional guidance for Safety Analysis Report and application requirements beyond the Safety Analysis Report, or SAR.

Slide 76, please.

So this is just a high-level overview that shows how ARCAP and TICAP work. If you look at the green-backgrounded material, the first eight chapters of the SAR, in the upper left-hand corner you'll see licensing basis evaluation analysis in Chapter 3 of the proposed SAR structure. You see safety classification for SSCs, safety-related SSCs, in Chapter 6; non-safety-related with special treatment in Chapter 7. The integrated evaluation chapter, or Chapter 4, is where you'll find defense-in-depth information. And as I indicated previously, Eric will be going over what's in those chapters later on in the presentation.

What I'm going to be touching is the ARCAP guidance that references TICAP for the first eight chapters of the SAR, and then also provides guidance for chapters outside of the SAR, outside of the first eight chapters of the SAR and also outside of the SAR. So if you look in blue in the left, you see Chapters 9, 10, 11, and 12 of the SAR content, which is outside the scope of TICAP. TICAP does not address normal operations by its nature. So that's why you see the need to provide guidance for SAR material for items outside of the TICAP scope.

MEMBER BLEY: Two quick questions.

MR. SEBROSKY: Go ahead.

MEMBER BLEY: One's kind of silly. I've been hearing TICAP for months and months, and now it's TICAP. Is there any deep meaning to that?

MR. SEBROSKY: No.

MEMBER BLEY: Okay.

MR. SEBROSKY: Internally, within our Branch, we use TICAP and ARCAP. Some in industry call it TICAP and ARCAP.

MEMBER BLEY: Okay.

MR. SEBROSKY: But you're going to hear Eric and I refer to it as TICAP and ARCAP.

MEMBER BLEY: I think I heard you say that ARCAP includes or encompasses TICAP?

MR. SEBROSKY: It does. And when you look at the ARCAP roadmap ISG, all it does, really, is it says, for the first eight chapters of the SAR, go see the TICAP --

(Simultaneous speaking.)

MEMBER BLEY: Oh, okay. Thanks.

MR. SEBROSKY: So if you look to the right, there's additional portions of the application that are outside the SAR that are, obviously, important, technical specifications being one of them.

So I'll be talking about some of the guidance that we're developing using an LMP-based approach for things like technical specifications that fall outside the SAR. I'll also be touching on fire protection for operations and in-service inspection and in-service testing.

Next slide, please.

So slides 77 and 78 just provide, in tabular form, the draft white papers that we've issued to date that we've used to engage stakeholders in public meetings that we've had on ARCAP and TICAP.

One of the most important documents I'll be talking about in the upcoming slides is what we refer to as the roadmap, the ARCAP ISG roadmap. So you see a date of December 2nd, 2021, and the ML number associated with it. I'll go over, at a high level, what's in that roadmap and why we consider that to be an important document.

Other ISGs that we've issued for ARCAP that are outside the scope of TICAP include Chapter 2 for site information; Chapter 9 for control of routine plant radioactive effluents, plant contamination, and solid waste; Chapter 10 for control of occupational doses; Chapter 11 on organization and human systems considerations; Chapter 12 on post-construction

inspection, testing, and analysis.

And as I indicated before, you see at the bottom of slide 77 references to the tech spec ISG, the fire protection for operations ISG, and the ISI/IST ISG.

Next slide.

So slide 78 are the key TICAP guidance documents. And what you see in this slide is NEI provided Revision 0 of NEI 21-07 on TICAP on August 30th. There's the ML number for that. And then, we issued an updated Reg. Guide draft white paper based on that August 30th version of the NEI 21-07 on December 2nd.

And at the bottom of slide 78, what you see is a note that the TICAP guidance document is being revised based on continuing interactions with stakeholders. We had a public meeting just earlier this week where we discussed NEI 21-07, Rev. 0-B, and there's the ML number for that.

And what Rev. 0-B did is provided changes to the NEI 21-07 based on a public meeting that we had with NEI and Southern back in November. As I indicated, we're continuing iterations on the Reg. Guide and NEI 21-07, Rev. 0-B, and we're planning for another public workshop in mid-January.

Next slide, please.

So what I just presented was kind of the high-level overview on how ARCAP and TICAP fit together. What I'm going to be talking about next is the ARCAP guidance; that draft white paper on SGs; provide a high-level overview, and identify areas that we think may be of interest to the ACRS.

Next slide, please.

So the next three slides -- slide 80, 81, and 82 -- are dedicated to the ARCAP, what we refer to as the ARCAP roadmap ISG. This is the document that we put together that, essentially, provides the staff and applicants a structure for where you would find guidance to put together a complete application.

So as I showed in the previous slide, it proposes a 12-chapter SAR guidance structure. The first eight chapters, it simply references to the TICAP guidance document. Chapters 9, 10, 11, and 12 point to individual ISGs developed for each of the SAR chapters. And it also provides pointers to draft white papers, guidance that's under development, or to be developed for portions of the application outside of the SAR.

So examples of guidance that the staff has developed outside of the SAR include tech specs, the

risk-informed ISIs; fire protection for operations. Examples of high-level guidance that is embedded in the roadmap include guidance for developing the Technical Requirements Manual, the Quality Assurance Plan, fire protection for the design, and then, the offsite dose calculation model.

Examples of guidance where we simply say it's being developed is security, emergency planning, material control and accounting, financial qualification, and cybersecurity.

Next slide, please.

CHAIR PETTI: So just a question.

MEMBER KIRCHNER: Joe, this is Walt Kirchner.

Just a question. It's more of maybe a process question than technical.

So one of the drivers here is that there are several advanced reactor concepts out there that may come into the NRC seeking a construction permit, or whatever. With the current 10 CFR 50 and 52, there are existing requirements for content of application. Is there a convenient tabular or cross-reference to what is currently required versus what ARCAP is going to replace and/or -- I think everything's there, but it's hard to see, since you're changing the structure

from the previous format for SARs. Is there some kind of tabular or table lookup that says, okay, you've got the current requirements and SAR chapters, and now, we have ARCAP and its content? Is there some cross-referencing table or document that shows that ARCAP covers all the bases that are required currently for a 50-52 application?

MR. SEBROSKY: The short answer is, no, we haven't developed that table. The long answer is we believe ARCAP will provide guidance on how, using the LMP process, you can address all the requirements embedded in 50 and 52 that are applicable to non-light water reactors.

So when you look at some of the example ARCAP roadmap ISGs that we've issued, it lists the underlying requirements for Part 50 or 52 that apply. So we have not developed a cross-reference table.

CHAIR PETTI: But it's fair to say that it's, say, more risk-informed than the --

MR. SEBROSKY: Yes, absolutely. So for this, Marty Stutzke yesterday talked to the ACRS about the TIRIMA approach, the Technology-Inclusive, Risk-Informed Maximum Accident Approach. And he indicated that he's working on a paper and, eventually, that type of guidance would end up in ARCAP, in some form

or fashion. That is down the road.

What the ARCAP roadmap ISG and the TICAP guidance, fundamentally, assume is an applicant is going to be using the LMP processes. So that's our first iteration on the guidance, and it is definitely risk-informed and technology-inclusive. And another key aspect is performance-based.

CHAIR PETTI: Right. Thank you.

MEMBER KIRCHNER: So going back to Marty's presentation from yesterday, his presentation showed a way to, essentially, check the box that's currently required in 50-52 to postulate a maximum hypothetical accident, and then, have a source term blah, blah, blah. Go through all that. So I get it; the LMP approach is a more risk-informed way for checking that box. And Marty had a nice diagram yesterday to show that.

But the reason I ask the question is, what about all the other things? I don't have the current format for SARs memorized, but I'll pick something randomly. Chapter 10 on electrical systems -- I think I got it right -- where does that fit into the ARCAP kind of structure? Or you say it's not a risk --

MR. SEBROSKY: Well, so at a very high level -- I mean, we're going to be talking about this

in a little bit -- but, at a very high level, I think what you might be referencing is NUREG-0800, SRP Chapter 8, on electrical power.

MEMBER KIRCHNER: Yes. Sorry, I misspoke.

MR. SEBROSKY: No, no, that's all right.

So if you look at Chapter 8 of the SRP, it is, obviously, based on large light water reactor technologies. So there's guidance on offsite electrical power, and there's guidance on safety-related diesels, AC power. There's guidance on DC power.

What you see out of the LMP process is the LMP process will identify the licensing basis events and the design basis accidents. And the outcome of that process is the SSC categorization.

So if there is a need for safety-related AC power, you're going to see that identified as part of the LMP process, and then, the safety-related AC power would be described in Chapter 7 of the structure, or Chapter 6 is where safety-related goes. And then, if you had important offsite power, the non-safety-related with special treatment coming out of the LMP process, that would show up in Chapter 7. So that's how that would work.

And similarly, you could say the same

thing about the instrumentation and control system. If the LMP process identifies the need for safety-related I&C, that would go in Chapter 6, and non-safety-related with special treatment in Chapter 7.

So that's, in a nutshell, kind of how it would work. As you know, there are some applicants that believe they can demonstrate to the NRC's satisfaction and to the ACRS's satisfaction that they don't have a need for safety-related AC power or a need for safety-related I&C.

MR. OESTERLE: Hey, Joe, this is Eric, Eric Oesterle from the staff. If I may add, you know, in response to the question?

So we expect that -- and I'll get into this in my presentation on TICAP -- we expect that, under the 12-chapter SAR guidance structure, that Chapters 6 and 7 will provide the bulk of the system descriptions and discussions of structures, systems, and components, and their design requirements that have, traditionally, been the focus of different chapters in the traditional FSAR structure.

And with respect to doing a cross-referenced table between TICAP and ARCAP and the typical FSAR structure, 19-, 20-, 21-chapter FSAR structure, it's a bit of a challenge because there are

a set of regulations that we are looking at for applicability to non-LWRs. So how you organize your information and where you put the information into the FSAR depends largely upon the applicability of the regulations to your design. So at this point in time, it's a bit of a challenge to put together a cross-referenced table like what was suggested or asked for.

MEMBER KIRCHNER: Okay. I kind of get that. I expected the answer that Joe gave, that a lot of those topical matters that may be important to safety -- and let me phrase it like that, "may be" important to the safety case -- would show up in Chapters 6 and 7 in your TICAP.

I'm just wondering -- again, it's more of a process question -- say an applicant comes in who is an advanced LWR. Can they use the LMP and do 50-52? I'm a little concerned about this non-LWR dichotomy that you're creating. If it's technology, essentially, neutral or technology -- what's the current phrase that you use all the time? -- inclusive --

MR. SEBROSKY: Inclusive.

MEMBER KIRCHNER: Yes. It seems to me that, as you go forward in this, the best way to test everything is with the knowledge base we have with the

LWR technology. And I could see an advanced LWR wanting to come in and use your structure. So could they do that?

MR. SEBROSKY: The short answer is yes. There's nothing that precludes a small modular light water reactor to use the LMP process and use the ARCAP/TICAP guidance or, for that matter, a large light water reactor.

MEMBER KIRCHNER: So just an observation in terms of terminology. This is just one member speaking. But you consistently, I think, have done a good job in trying to make what you're doing technology-inclusive, but you consistently label everything that we see non-LWR.

MR. SEBROSKY: Yes, and I will take that back. I think that's a legitimate comment.

MEMBER REMPE: So this is Joy.

And I'd like to add to Walt's comment, because I'm curious if all of the staff believes this. For example, we heard, oh, we're very well coordinated with the Part 50-52 folks, the same people. But, yet, I've heard in informal discussions, when I was asking about how well are things coordinated, I've heard, well, the 50-52 is for the LWRs and the 53 is for the non-LWRs. So I'm not sure that everyone on the staff

has that viewpoint.

MR. SEBROSKY: I understand the comment. And I'd just point to Part 53 in the current format. It is not restricted to non-light water reactors.

MEMBER REMPE: And conversely, 50 and 52 can be used by non-LWRs, right?

MR. SEBROSKY: Yes, absolutely. And what you'll see in a slide on 81, slide 81, is one of the appendices that we're going to include in the ARCAP roadmap ISG, as applicability of regulations to non-light water reactors.

But, at the end of the day, if somebody comes in under a 50 or 52 application, they're going to have to demonstrate that they meet all the applicable underlying requirements.

MEMBER REMPE: So out of curiosity, then, back to another comment that Walt made yesterday, if I'm a design developer, and I always want to try to do things as economically as possible, which way would be easier for me to get through the hoops and get my plant up and running? And Walt had mentioned we want to make sure we have the same level of safety, and we want to convey to the public we still are as safe. Is there something that, you know, have you thought about, well, is there a way that somebody that's very

clever will know I could get through one path a little easier with less expensive safety systems?

MR. SEBROSKY: So to answer your question, I don't believe that -- a designer is going to have to look at their design and say, what regulatory path do I think is best for me? Either using the LMP process or a more deterministic process, as Marty outlined yesterday. So I don't think one path is necessarily easier.

If you look at the LMP-based process, it, obviously, heavily relies on PRA. And you heard from the discussion yesterday with Marty that some designers believe that their designs are of a nature that developing a detailed PRA does not make a lot of sense.

So to answer your question, the framework that we're developing is meant to be able to demonstrate that all the existing applicable regulations are met for either 50 or 52 and down the road for 53.

MR. LYNCH: Joe, this is Steve Lynch.

If I can augment some of what you're saying for some background on the Part 50-52 rulemaking and the Part 53 rulemaking, and the existing requirements and ease of path and

coordination?

So with respect to coordination, we do have weekly meetings where the cognizant Branch Chiefs or the various rulemakings associated with advanced reactors do meet to coordinate and make sure that we are on the same page and understand the status of these rulemakings at the working level. We do have additional plans to add further coordination, touch points, on a biweekly basis, starting in the new year, to make sure that any rulemakings that could impact our path forward on Part 53 are identified and addressed, and any potential inconsistencies are identified and we can resolve those promptly.

Also with respect to ease of licensing, one thing I do want to note, that our existing regulatory requirements for nuclear power reactors are very much tailored to existing large light water reactors; namely, PWRs and BWRs. And one of the reasons for crafting Part 53 is to reduce the need for exemptions that may be needed on advanced reactor technologies that may come under the existing regulatory requirements.

So while non-LWRs and advanced reactors may be able to come under the existing regulatory requirements, I'm not sure that, where we stand today

with the current requirements and the other rulemakings under development, that we can definitive answer on what is easier. The idea is that, when we finish the rulemakings that we are currently working on, that we will have -- you know, all of these pathways will meet the technology and design needs of the industry. So that, regardless of the path they choose, they will be able to have predictable requirements that they can follow for their designs, and use the types of analyses that meet the needs of their technology.

MEMBER REMPE: So I appreciate that, but I think, again, I liked what Marty had yesterday with his little diagram on slide 36. But I think, as we move forward, understanding the conservative estimates that are used not only for the frequency, which I get that one, but how they estimate the consequences might play into what path a person picks and how much conservatism is left in the design that they propose to go forward with. But, you know, we'll just have to see.

MR. SEBROSKY: Yes, absolutely, agree with you completely.

Can we go to slide 81, please?

So getting to some of the discussion that

we just had, the ARCAP roadmap ISG includes several appendices. And I'm going to jump to Appendix D, which is just a placeholder for now. But this is where you would find the applicability of regulations to non-light water reactors. Now that appendix is going to be based on a white paper that has been discussed during advanced reactor public stakeholder meetings. And the ML number for that white paper is provided at the bottom of this slide.

And the purpose of placing that white paper in Appendix D is to capture that guidance in a product that will benefit from a formal public comment period. Obviously, Appendix D, as Steve had indicated or alluded to, the idea behind Part 53 is a non-light water reactor would not need to use that Appendix D because built into Part 53 would be a process that would allow the use of LMP without the need for exemptions from regulations.

Appendix C is embedded in the ARCAP roadmap ISG. It's based on pre-application white papers that have been discussed during advanced reactor stakeholder meetings. It stresses the need for pre-application engagement. And again, we're proposing to capture that important white paper in the ARCAP roadmap ISG in order to allow it to benefit from

a public comment process that's embedded in an Interim Staff Guidance document.

Next slide, please.

So on slide 82, another one of the appendices that you'll see in the ARCAP roadmap ISG is Appendix Echo, or E, which provides construction permit guidance. It consists of three parts. There's a common portion that's applicable to both light water reactors and non-light water reactors. It's in italicized format in that appendix currently.

Our sister Division, the Division of New and Renewed Licenses, just issued a Federal Register notice for light water reactor construction permit Interim Staff Guidance that includes a 45-day comment period. And that ISG, the light water reactor CP ISG is scheduled to be discussed at an advanced reactor stakeholder meeting in January. We will update the common portion of Appendix E with whatever comes out of the light water reactor construction permit ISG, which also includes that common part.

The other information that you'll find in Appendix E is portions of the construction permit that's applicable to the LMP-based approach, and it points to the TICAP construction permit guidance, and then, portions of a construction permit guidance that

is outside the scope of TICAP. So that's what's embedded in Appendix E of the ARCAP roadmap ISG white paper.

Next slide, please.

MR. WIDMAYER: Hey, Joe, this is Derek.

MR. SEBROSKY: Yes, Derek?

MR. WIDMAYER: Yes, a question on slide 82. We saw the light water reactor construction permit ISG when it came out, and we were thinking about having a meeting. Should we wait until all of Appendix E is prepared? Would that make more sense?

MR. SEBROSKY: My short answer would be, no, Derek.

MR. WIDMAYER: Okay.

MR. SEBROSKY: That light water reactor construction permit ISG is meant to be a standalone document.

MR. WIDMAYER: Okay.

MR. SEBROSKY: From our perspective, the common portion of that document, we intend to take advantage of what our sister Division is doing and copy it, copy and paste it into Appendix E.

MR. WIDMAYER: Okay, great.

MR. SEBROSKY: So does that answer your question?

MR. WIDMAYER: Absolutely, yes. Thank you.

MR. SEBROSKY: Can we go to slide 83, please?

So the next several slides kind of went over the ARCAP roadmap ISG and what's in it, and why we believe it's important. The next several ARCAP slides are dedicated to the ARCAP ISG white papers that we've issued on several topics.

And again, just highlighting within those chapters what we think may be of interest to the ACRS. So for ARCAP Chapter 2, for site information, that falls outside TICAP. It supplements the information in the SAR that is outside the scope of the Licensing Modernization Project.

One of the intentions that's described in that ARCAP Chapter 2 is to limit the amount of the information in SAR Chapter 2 to what is necessary for establishing the safety-significant design parameters. So the concept is similar or uses the approach that's been taken for the current operating fleet, where much of Chapter 2 is considered historical information.

The idea is that information, in order to make our safety findings, would be available via audit, but only the supporting basis and the key

parameters necessary for establishing the safety-significant design parameters would be embedded in the SAR.

One of the other things that you'll see in SAR Chapter 2 that you need is Section 2.6. It includes a process for establishing the ground motion response spectra using the SSHAC process, or the Senior Seismic Hazard Analysis Committee process. So 2.6 is a little different than what you would find otherwise in the current guidance.

ARCAP Chapter 9 and 10, this is normal effluents and occupational doses. Going back to an earlier question about risk-informed, it's technology-inclusive, risk-informed, and performance-based. So using the performance-based approach, the level of detail of information in the SAR for these two chapters is proposed to be smaller than what you would typically get. Again, information available via audits, and then, key information in the SAR that supports our safety finding, but the performance-based approach relies on the ongoing, underlying requirements that would be applied to both normal effluents and occupational doses, once the plant is up and running.

MEMBER KIRCHNER: So, Joe, could we test

this? I'm a little confused. First of all, ARCAP Chapter 2 is not TICAP Chapter 2?

MR. SEBROSKY: So we called it ARCAP Chapter 2 for site information. And one of the reasons that we did that is, as part of the LMP process, you look at key parameters from a particular site to ensure that your design is robust enough that it could handle flooding, seismic, that kind of thing. So when we say ARCAP Chapter 2, we could just call it site information.

MEMBER KIRCHNER: Well, it supplements what would be required in the TICAP, which is really going through the LMP process.

MR. SEBROSKY: Correct.

MEMBER KIRCHNER: Why not just do away with TICAP and call everything ARCAP? That's just an observation.

But let me go to my more substantive question. Let me test you. So ARCAP Chapters 9 and 10, occupational dose, why would a performance-based approach have less information in the SAR for occupational dose analysis than the current approach that's used?

MR. SEBROSKY: So for the occupational dose, if you look at the ARCAP guidance, it,

fundamentally, presumes that, under a performance-based approach, there will be a continuing need to ensure that the occupational dose requirements are met, once the plant is up and running. So there's heavy reliance on that.

MEMBER KIRCHNER: What's new? That's required now.

MR. SEBROSKY: Excuse me?

MEMBER KIRCHNER: That's already required now. So what lesser amount of information would be provided under a performance-based approach to address the staff's review on occupational dose?

MR. SEBROSKY: Yes, so if you go to a typical recently-issued chapter, the analogous chapters in the SRP are Chapter 11 and Chapter 12 for normal effluents --

MEMBER KIRCHNER: Right.

MR. SEBROSKY: -- and occupational doses. It's quite voluminous. And that information is not -- it demonstrates that you can meet, from a design standpoint, you have enough shielding to meet the occupational -- you have confidence that you'll meet the occupational dose requirements.

So there still needs to be a demonstration to the staff's satisfaction that the normal effluents

and the occupational doses, the design of the plant is such that you'll be able to meet the underlying requirements in order for us to make our safety finding.

But the amount of material that is placed in the SAR is proposed to be limited to key information associated with the design of the plant, and not necessarily voluminous --

MEMBER KIRCHNER: But I'm having a hard time figuring out why 0800 wouldn't be adopted for this. Now, if you're saying 0800 requires too much information, well, that suggests you could edit 0800. But I don't get this performance-based approach requires less information.

MR. SEBROSKY: I understand. I understand your point. We chose not to revise 0800. We chose to provide the new Chapters 9 and 10.

But, certainly, the underlying performance of --

MEMBER KIRCHNER: Again, it would be an interesting exercise for you to do a comparison. Let's just pick on occupational dose for a minute or effluents, one or the other. And just develop a table that explains why you need less information to get a performance-based assurance that the workers are

protected.

MEMBER BLEY: But, Walt, this is Dennis.

MEMBER KIRCHNER: Yes?

MEMBER BLEY: I missed something along this train of discussion. I don't see where they say it requires less information, which is what you're asking them about. Did I miss it? Did they talk about that?

MR. SEBROSKY: Yes, what we say is, if you look at that, if you look at Chapter 9 and 10, we're proposing less level of information in the SAR. But the information, if you go back -- can we go back to slide 76?

So one of the fundamental concepts that we're using in ARCAP and TICAP, it's they're performance-based. And in the middle you see audit inspections of applicant records; calculations analysis; P&IDs; system descriptions; design drawings; procurement specs, and the PRA. That level of information is proposed to be available to the staff, and then, key information that is necessary is either elevated to the SAR or to some other product.

MEMBER BLEY: I'm still missing a little bit of the thread here. The reason one would prefer performance-based criteria is that, instead of a fixed

line in the sand, sometimes fairly arbitrary, you're looking at actual performance and do they meet a performance standard. And that isn't directly related to more or less or a higher- or lower-level of information. So I'm confused where this discussion is going.

MR. OESTERLE: This is Eric.

Let me just add that, Dennis, you're on the right track there. You know, for this area, there's a combination of design features, and then, programs that are relied upon to ensure these doses.

And in this area, there's a greater reliance on programs. And we do point to already established guidance for developing approved programs for these areas that were also developed for new reactors. And so that's really the gist of this. It's a less prescriptive approach, but the approach, we believe, still provides the same level of assurance and protection of workers with respect to dose.

MEMBER BLEY: Okay. We're back to where Walt was headed. And, Walt, you have to fix me if I'm not saying this right.

I think he's asking, what specific areas under various criteria here will be different, and how will they be different? And I have heard anybody

really talk to that. And you could stick with occupational dose just for discussion.

MEMBER KIRCHNER: My own opinion is that currently is performance-based. I mean, yes, there are prescriptive limits that you can't exceed, but the actual design, you know, how the designer goes about providing the necessary shielding, et cetera, to protect, say, the control room operators or staff, it's the methodologies are going to be very similar.

So the presumption that you need less information to do this, or at least the assertion, I was just wondering how that comes about. Maybe the existing requirements for 0800 require more information than is useful to do a performance-based evaluation. If so, one could go back and think about revising 0800.

But, basically, with the current fleet, that's a performance-based kind of analysis that you do to demonstrate that the control room occupants aren't, you know, that you're maintaining their exposure levels below the 10 CFR 20 limits.

MR. SEBROSKY: So I would encourage -- we understand the feedback. We'll take a look at Chapter 9 and 10. But if you go back to the fundamental reason for the briefing, it's to outline what we have

in the different ISGs in areas that may be of interest to the ACRS.

MEMBER KIRCHNER: No, that's fine, Joe. I wasn't criticizing. I'm just trying to understand why the suggestion that you would need less information to do an occupational dose kind of hazard analysis because you're doing it on a performance-based level --

MR. SEBROSKY: So I guess what we're suggesting is there would still need to be a demonstration and calculations provided to the staff that allow us to make a determination for the design, that the design will meet the -- that we have confidence that, once it's up and running, the design will meet the underlying requirements.

How much information from that analysis gets placed in the SAR is what we were revisiting in those chapters.

CHAIR PETTI: Right. Then, instead, you might audit things as opposed to having them in the SAR per se?

MR. SEBROSKY: Correct.

CHAIR PETTI: Okay.

MEMBER KIRCHNER: Okay. Fair enough. I didn't mean to hold you up, Joe.

MR. SEBROSKY: No, that's okay.

MEMBER KIRCHNER: Joe, thank you.

MR. SEBROSKY: It's a good question.

So slide 84.

Chapter 11, so there's two slides on Chapter 11, which is organization and human systems consideration.

Yesterday, Jesse Seymour walked through the concept of operations for some of the potential designs that may be coming our way. This ARCAP Chapter 11, fundamentally, assumes a control room design that has operators and looks more like a traditional control room design.

We have near-term construction permit applicants that intend to use the LMP process. So what we did, kind of as a stop gap, is say, okay, what do we need to support those designs that are using an LMP process in the human factors engineering area? With the idea that, as Jesse indicated yesterday, once the Part 53 language is developed, we will include updates in either this ARCAP ISG or another ARCAP ISG for some of the items that were discussed yesterday.

So when it comes to human factors engineering, what we see coming out of the TICAP process, the Licensing Modernization Project process,

is identification of human factors insights that would be fed into a human factors engineering program.

So TICAP or the LMP process provides limited guidance on what to include in the SAR in this area. So that's why ARCAP Chapter 11 takes the insights from the LMP and provides guidance on how those insights might be used to develop an HFE program. And it supports the ideas that would support that information would support the necessary information for us to make our findings when it comes to the human factors engineering program.

Slide 85.

MEMBER KIRCHNER: Joe, this is Walt again. Sorry to hold you up.

MR. SEBROSKY: No, it's all right.

MEMBER KIRCHNER: I'm having trouble again. And the reason I'm having trouble is LMP has -- let's just put aside LMP for a moment and just talk about reactor design.

Now, I'm the advanced reactor concept designer. I'm trying to probably rely on inherent passive characteristics in my design and try to take, as much as I can, take the human out of the loop. But, to the extent I still have a human in the loop, like an operator in a control room, you already have

a lot of experience with HFE programs and such. So where I'm struggling is, what would change?

Obviously, you would tailor the HFE program for the specific design, but the basics don't change from what is being done currently. It just may mean that we have less operators, maybe no operators. That's a different conversation, and so forth. But that doesn't really have anything to do with LMP. That's all about how you design the system and how you design the human interface with the system, and what's required to safely operate the plant.

And I'm having a little problem to see why you need to supplement guidance. It just doesn't make sense. It has nothing to do with LMP. It has everything to do with the design. So why would the human factors engineering program change from what you're currently doing in Chapter -- now don't hold me to this -- 17?

MR. SEBROSKY: Well, yes. So NUREG-0800, Chapter 18, is where you find --

MEMBER KIRCHNER: Sorry.

MR. SEBROSKY: No, that's all right.

That's where you find human factors engineering. What we did is we looked at that at a high level. We looked at what was proposed in TICAP

and in the 12-chapter SAR content. And we believed we needed to pull over some of that SRP human factors engineering over into ARCAP Chapter 11.

MEMBER KIRCHNER: Okay. So you're tailoring 18 --

MR. SEBROSKY: Yes.

MEMBER KIRCHNER: -- to your needs here? Fine. That's good. Thank you.

MR. SEBROSKY: Correct. Jesse, is there anything you wanted to add?

(Simultaneous speaking.)

MR. SEYMOUR: Yes, Joe, if I could for just a moment. I just wanted to kind of just articulate really what we were shooting for in the addition that we made for HFE in ARCAP Chapter 11, and there's two layers to it: There is the design layer and by and large there we're still pointing to the existing guidance that we have. So we have NUREG-0711, which has a very comprehensive human factors engineering process that's spelled out there. And that part hasn't changed. So again, we still are pointing to guidance that's out there in those areas.

But what is significant that changes, really there's two layers: One is how would we accommodate exemption requests that are submitted

against the specific requirement of 50.34(f)(ii), and that's the requirement to apply the state-of-the-art human factors engineering in the control room design.

So for example, if we were to have some advanced reactor design that came under the Part 50 and 52 -- and we'll take this to the extreme and say perhaps they don't have a control room, a conventional control room in that design, an exemption would need to be involved in order to ascertain the details of okay, where is -- where will these functions be accomplished from and so forth? So again, there would understandably be a need to navigate exemptions within that. And that's part of what we do.

But more broadly -- and this is really the crux of the matter is we've got a higher level of effort to take our (audio interference). We've got higher level effort in place to take our human factors engineering reviews and to make those scalable in nature. So the current approach that we take under the NUREG-0711 process is very regimented. I think there's 330 give or take discrete criteria that are within that, and based upon the nature of these advanced reactor designs not all of that may be necessary to achieve a reasonable assurance of adequate safety.

So what we have with our scalable HFE review process is an ability to come in and conduct activities associated with characterization and targeting and scoping to go through and figure out from a safety perspective what are the things that we need to look at and to craft a tailored review that is appropriate to that facility? And part of the change that we incorporated into Chapter 11 is basically to make that link with that program so that when it's available we'll be able to apply that not only to the Part 53 applicants, but also to applicants coming in under Parts 50 and 52.

So again, our actual change isn't very wordy. It's really just kind of one concise block, but it's really meant to address those three layers.

MEMBER KIRCHNER: Okay. Thank you, Jesse.

MR. SEBROSKY: So this is Joe Sebrosky again. Can we go to slide 85, which is a continuation?

One of the things that you see in ARCAP Chapter 11 is a discussion of operator licensing. There's a recognition within the ARCAP chapter that the guidance that's proposed goes beyond the guidance that we expect to see in an application. And the reason -- what we tried to do is in that chapter is

provide a holistic approach for how one might go about qualifying a simulator or the use of a simulator for operator training, experience, and examination, and also operator licensing issuance prior to fuel load.

So we think providing information that goes beyond what would be expected in an application in this area is beneficial to both the staff and applicants to look at these particular areas that could end up being in the critical path for getting a plant up and running.

As far as the operator staffing guidance, it includes areas such as an option for providing a technical basis for control room staffing in conjunction with the control room configuration and it would potentially provide the technical basis that could support a future exemption. 50.54(m) and 50.54(k) go to the staffing requirements for senior reactor operators and reactor operators in a control room.

Next slide, please? So ARCAP Chapter 12. This is a post-construction inspection, testing, and analysis program for Part 50 applicants. There are requirements for post-construction inspection for Part 52 applicants. You find this information also imbedded in the requirement for ITAAC, inspections,

test, analysis and acceptance criteria.

So this chapter provides high-level guidance for post-construction testing, both pre-operational testing prior to initial fuel load and then also initial startup testing obviously after fuel load. And as the ACRS knows ITAAC ended fuel load, so there's still a need for guidance for 50 and 52 applicants that would cover startup testing after fuel load.

Next slide, please? So the tech spec guidance. This is outside the SAR. And when you look at this ARCAP ISG, the white paper, the reason that we developed the white paper guidance is to provide a nexus between the requirements in 50.36 where you find the regulation for tech spec content. And the information that you get from the LMP approach, that would be helpful in -- from the LMP approach for developing safety limits, limited safety system settings, and limited condition for Operations Criteria 1 through 3.

So what you see in this ARCAP ISG is again a nexus between the text in 50.36 and the outcomes from an LMP process from NEI 18-04, which gives you the required safety functions. NEI 18-04 gives you the required safety functions, the safety-related

SSCs, frequency consequence targets, and assurance that you're meeting the underlying 10 CFR 50.34 dose limits. So the ISG just tries to tie those two concepts together.

Next slide, please? Fire protection for operations. One of the things I alluded to earlier was Appendix D, the ARCAP roadmap ISG eventually, including a list of applicable regulations for non-light water reactors. So what you see imbedded in the white paper that's been issued is 50.48 applies for fire protection; 50.48(a) applies for fire protection; 50.48(b), which is for fire protection, refers you to Appendix R for light water reactors; and 50.48(c), or Charlie, points you to NFPA 805 again for light water reactors.

So 50.48(a) applies. And what this ARCAP ISG does is it leverages the information from NFPA 805 for a risk-informed approach to meet -- to demonstrate you can meet the underlying requirements imbedded in 10 CFR 50.48(a), which does apply to non-light water reactors.

MEMBER KIRCHNER: Can we test this again, Joe? I'm just being your nemesis today. Don't take it personally.

MR. SEBROSKY: No, that's okay. Go ahead.

MEMBER KIRCHNER: So why would 805 not apply to a non-LWR?

MR. SEBROSKY: It flat out says as a requirement that it only applies to light water reactors. The underlying requirement is limited to light water reactors. 50.48(b) and 40.48(c) are limited to light water reactors.

MEMBER KIRCHNER: No, I'm wondering --

MR. SEBROSKY: 50.48(a) is not.

MEMBER KIRCHNER: -- why the NFPA standard, the standard itself -- why would you not use that standard?

MR. SEBROSKY: So what the ISG says is we think there are -- if you have a risk-informed approach, and LMP does look at fire protection --

MEMBER KIRCHNER: Right.

MR. SEBROSKY: -- and you have results from that, that we believe there's concepts from NFPA 805 coming out of the LMP process that can be utilized. That's what that ISG is all about.

MEMBER KIRCHNER: Okay. So you're still going to use -- how should I -- I think this would be a concern I would raise across the board, not just here in fire protection. A lot of these -- a lot of what you have in the current regulation obviously has

been developed because of the experience with the LWR fleet, but the overall concept of fire protection and such for a nuclear power plant applies to any concept.

And then so when you go into something like NFPA 805, which I will admit I'm not intimately familiar with, then in this ISG you're going to look at the underlying, how should I say, concepts and intent that would be applicable to a non-LWR system. Is that the approach you're using when you say --

MR. SEBROSKY: Yes, I guess I would take it just a step further. Fire protection is looked at as part of the LMP process. There's an operations aspect and there's a design aspect. So you're certainly going to have risk information from the LMP process that will factor into the design.

But when it comes to operations, as you indicated, we think that -- even though 50.48(c) does not apply to non-light water reactors we think using a technology-inclusive, risk-informed, performance-based approach that certainly there's concepts that can be used out of 805 to demonstrate that you meet the applicable requirement, which is 50.48(a) when it comes to operations. And that's what this -- if you look at the ISG, that's what it attempts to do, is tie this together.

MEMBER BLEY: Yes, where Walt's coming from I think, and at least where I take it, is what you're pointing out about 48(c) is that definitionally it's not applicable, but functionally or on an engineering or analysis basis I don't know any particular reason why we would say that's true.

MEMBER KIRCHNER: Yes, thanks, Dennis. Functionally. That's a better way to look at it rather than intent. Thank you.

MR. SEBROSKY: So I think we might be saying the same thing. We believe that the concepts imbedded in 805 can be used functionally to demonstrate that you meet the underlying requirement that is applicable to non-light water reactors, which is 50.48(a).

MEMBER BLEY: Okay.

MR. SEBROSKY: I think we might be saying the same thing, but that's the reason that we developed the ISG for operations is for that exact -- the underlying concern that when it comes to operations what guidance are we going to provide knowing that Appendix R and 50.48(c) does not apply to non-light water reactors? So that's -- we attempted to fill that hole with that ISG.

When it comes to fire protection for the

design phase, you see imbedded in the ARCAP roadmap ISG staff's thoughts on how the LMP process can be used to inform the design phase and then also current regulatory guides for fire protection design that we think are useful again for demonstrating the underlying requirements for fire protection. So fire protection designs --

MEMBER KIRCHNER: I've observed, too, Joe, that some of the new -- some of these advanced designs are using -- well, let's just for an example, liquid metal systems that present fire hazards and risk that go way beyond an LWR.

MR. SEBROSKY: That's correct. And that's why you'll see in the ARCAP roadmap ISG mention of that for the design phase. Specifically mentions the types of coolants that may present a fire risk that go beyond what we have in our current guidance. So you'll see that type of language in the -- for the design phase, in the fire protection section for the design phase in the ARCAP roadmap ISG.

We didn't see the need for pulling that out and developing a separate ISG. We think the guidance imbedded in that roadmap is a pretty good -- is pretty good guidance and we didn't see the need for having to pull it out. For the operational phase we

saw the need to have a separate ISG.

Next slide, please? So when it comes to when of the last items that I'm going to be covering is the ISI and IST risk-informed ARCAP guidance that we came up with. There's two slides on this. And the ISG that we developed can be used for both advanced light water reactors and for non-light water reactors. One of the things that it references is ongoing work associated with ASME Section 11, Division 2, which is the Reliability and Integrity Management Program for Nuclear Power Plants.

So if you go to the next slide? Fundamental to the concept is if you're using an LMP-based approach, you will have a PRA, and you can use that PRA to develop both a non-light water reactor and service test programs and in-service inspect programs.

And for the IST if -- for non-light water reactors you have the potential for active valves, pumps, and to dynamic restraint devices like you see in large light water reactors, but what that ISG also looks at is passive components with active safety functions that may need to be included in the IST Program.

And one of the examples that we provide in that ISG heat pipe, what type of program would be

needed for that particular feature when it comes to IST. So when you look at that document, ARCAP ISG on ISI and IST, it's 31 pages in length and it goes into quite a level of detail for both light water -- advanced light water reactors and non-light water reactors.

So this concludes my presentation on highlights of the -- what you find in the ARCAP roadmap ISG and also what you find in ARCAP ISGs outside of the SAR structure. And with that, I'd like to turn it over to my colleague Eric Oesterle to continue the presentation.

CHAIR PETTI: So, Joe, just a question. When you add up all the piece parts ARCAP sounds like it's going to be a bigger document than TICAP. Is that true?

MR. SEBROSKY: Certainly. Just looking at the ARCAP roadmap ISG with all the appendices in it, it's heading north of 100 pages.

CHAIR PETTI: Yes. Okay.

MR. SEBROSKY: So the ARCAP roadmap ISG by itself is a rather -- it's going to be a rather large document. And then if you add up all the different ARCAP ISGs that we've issued to date, some of which are 30 pages in length, yes, it's a larger volume of

information than what you would find in the NEI 21-07 and the TICAP Reg Guide.

CHAIR PETTI: Yes.

MEMBER BROWN: Before we -- is that -- are you done, Dave?

CHAIR PETTI: Yes.

MEMBER BROWN: Can I ask a real simple-minded question? We talk about the SAR for the TICAP And SAR for the ARCAP. Are those -- does that mean a new plant designer has to have two SARs?

MR. SEBROSKY: No, I guess --

MEMBER BROWN: One covering the ARCAP and one covering TICAP in addition to whatever other licensing document they need from the LMPs?

MR. SEBROSKY: So the short answer is no. Can we go back to -- I'm looking for the slide. Can we go back to slide 76?

MR. OESTERLE: Hey, Joe, I can hit that further in my discussion.

MR. SEBROSKY: Okay. I guess I was just to show -- I thought this figure would demonstrate to Mr. Brown what we envision. The first --

MR. OESTERLE: It does, and I'm going to refer to that.

MR. SEBROSKY: Okay. So --

MEMBER BROWN: Okay. That's fine. I just -- I saw -- when I -- I went back as you were going through this in these discussions with Walt and looked at the definition of chapters that would be in each of these TICAP and ARCAP configurations, and it hadn't dawned on my before based on the other discussions at previous meetings. How many SARs are we going to have associated with -- where is the basic fundamental licensing document that covers everything? So that was my question.

MR. SEBROSKY: Yes. So the short answer is that an applicant only needs to submit one safety analysis report with their application, however the development of that SAR will need to rely on both TICAP and ARCAP guidance, especially if they're using the LMP process to develop major portions of their SAR.

MEMBER BROWN: But the chapters are different. They appear to be different.

MR. SEBROSKY: So the first eight chapters under ARCAP, you refer back to the TICAP guidance. Yes, the chapters are different between the TICAP and ARCAP versus the traditional FSAR organizational structure, but it was deliberately organized in that way.

MEMBER BROWN: Okay. I understand it back on what today's stuff is under Part 50 and 52. When I look at this diagram I see an outline of a SAR and it -- that is an SAR, right? Is that the SAR that an advanced reactor -- is that the format that it would be used --

MR. SEBROSKY: Yes. Yes.

MEMBER BROWN: -- in the LMP process? Is that correct or not?

MR. SEBROSKY: Yes, that's correct.

MEMBER BROWN: Okay. Now where is --

MR. SEBROSKY: The first eight chapters come from TICAP, and the 9, 10, 11, and 12 come from ARCAP. And all ARCAP does --

MEMBER BROWN: Oh, okay. I see it says outside the scope of TICAP. I got it.

MR. SEBROSKY: Right. Yes, so all ARCAP does, the ARCAP roadmap ISG, when you look at it, it says for the first eight chapters of the SAR go see TICAP.

MEMBER BROWN: Okay. And for the subsequent chapters, 9 through 12, it would be --

MR. SEBROSKY: It points --

MEMBER BROWN: -- from ARCAP?

MR. SEBROSKY: Yes. So the ARCAP roadmap

ISG points to the individual ARCAP chapters that I just talked about, ARCAP ISG Chapter 9, 10, 11, and 12.

MEMBER BROWN: Okay.

MR. SEBROSKY: So the roadmap --

MEMBER BROWN: All right. That's fine.

MR. SEBROSKY: Yes.

CHAIR PETTI: So just a follow-on then. The orange box, how does that get submitted? It's separate individual documents potentially?

MR. SEBROSKY: Yes.

CHAIR PETTI: Okay.

MR. OESTERLE: So if we could go to I think it's slide 90 or 91. Thank you.

MR. WIDMAYER: Hey, Eric?

MR. OESTERLE: Yes.

MR. WIDMAYER: This is Derek. I think aren't some of the applicants like providing topical reports and stuff like that to provide the information in that orange box?

MR. OESTERLE: Yes, in fact some applicants are providing topical reports that are -- will end up being referenced in the individual chapters of the safety analysis report as well.

MR. WIDMAYER: Okay. Thanks.

MR. OESTERLE: Sure.

MEMBER BROWN: Can I ask one other question?

MR. OESTERLE: Sure.

MEMBER BROWN: Back up to 75 again. And this was relative to that. I understand your point about how the chapters separate, but then I see this stuff back here. It says industry is developing key portions of TICAP guidance for NRC endorsement. Is that in addition to the NRC-developed TICAP guidance in the whatever TICAP document we have in the LMP process?

MR. OESTERLE: Yes, I'll --

MEMBER BROWN: Is that another document?

MR. OESTERLE: -- be getting into that in my presentation --

MEMBER BROWN: Okay.

MR. OESTERLE: -- Member Brown.

MEMBER BROWN: I'll pass.

MR. OESTERLE: Okay.

MEMBER BROWN: Thank you.

MR. OESTERLE: Sure. So if we can move to slide 91, please? All right. Great. Thank you.

So thanks for the turnover, Joe, and good morning everyone. As Joe mentioned --

MEMBER KIRCHNER: Are we --

MR. OESTERLE: Yes?

MEMBER KIRCHNER: Eric, this is Walt.

MR. OESTERLE: Yes. Can you hear me?

MEMBER KIRCHNER: May I interrupt you? Before you get going, Mr. Chairman, can we have a break?

CHAIR PETTI: I was just looking at that. Their agenda wanted us to go another 30 minutes. I have a feeling this could take us a little longer than that based on the level of interest. So do you have a problem if we do the break now?

MR. OESTERLE: I do not have a problem.

CHAIR PETTI: Okay.

MR. OESTERLE: As you wish.

CHAIR PETTI: Okay. Let's do a 20 minute break. Come back at 20 after.

(Whereupon, the above-entitled matter went off the record at 10:58 a.m. and resumed at 11:20 a.m.)

CHAIR PETTI: Okay. It's 20 after the hour, so let's reconvene here.

Eric, the floor is yours.

MR. OESTERLE: Yes, I'm ready to go. Okay. Thank you.

Good morning again. My name is Eric Oesterle and I'm also a senior project manager in the Advanced Reactor Policy Branch in NRR and working with Joe on this important effort. This morning I'll provide an update on the staff's efforts to develop guidance as part of the Technology-Inclusive Content of Application Project, of TICAP. We like TICAP.

Next slide, please? So the goal of the TICAP effort is to develop guidance for preparing major sections of the safety analysis report portion of an application using a technology-inclusive, risk-informed, performance-based approach. For reference Joe provided a visual representation of the major portions of the safety analysis report addressed by TICAP on slide 76, which we were just recently on.

The scope of the TICAP guidance is governed by the Licensing Modernization Process, or LMP, which is documented in NEI 18-04 and endorsed by the NRC in Reg Guide 1.233. The LMP process provides a robust, integrated, and iterative design process which identifies licensing basis events; determines safety classification of structures, systems, and components; establishes special treatments for SSCs; and ensures adequate defense-in-depth.

As Joe mentioned earlier industry and the

NRC have been working together to develop TICAP guidance. The industry TICAP team has developed proposed TICAP guidance in NEI 21-07 and the NRC is reviewing this guidance for the purposes of endorsement in a regulatory guide. It should be noted that the baseline guidance in NEI 21-07 is for a combined license application under 10 CFR Part 52 and includes supplemental guidance for construction permit applicants and design certification applicants if different than for a COL applicant.

The TICAP guidance will be updated to provide greater applicability to Part 53 as the rule language for that proposed rule is finalized. We recently held a public meeting on December 14th to discuss comments on the TICAP guidance and we continue to work together towards resolving issues that may otherwise be identified as exceptions or clarifications in the NRC's endorsing regulatory guide. Later during this presentation I'll provide you with an update on one of the guidance issues that was discussed at the December 14th meeting.

Next slide, please? Okay. We're on slide 93 and over the next few slides I'll walk you through the eight-chapter SAR structure discussed in the TICAP guidance.

Chapter 1 provides a general plant and site description at a high level and provides a high-level summary of the safety case made throughout the rest of the SAR. It is similar in comparison to what you see in FSAR Chapter 1 for operating plants and includes items such as those identified in this bullet. Certain analyses in analytical tools or methodologies are used in the identification of licensing basis events, the evaluation of the consequences of such events, or assessing the performance of SSCs.

Chapter 2 of the SAR presents information on some of those analyses in analytical tools such as the PRA, the design-basis accident analytical methods, and source term analysis. It is intended primarily for cross-cutting information or evaluations that support multiple LBEs or SSCs and providing that information or evaluation up front in one place is intended to make the documentation that follows in subsequent chapters more efficient and concise. There will be pointers to other sections and chapters where the results and insights from these analyses are used in the design process.

Chapter 2 of the SAR would also discuss other methodologies and analyses that are driven by

the nature of the facility and the safety case. These may include, for example: civil and structural analysis; piping analysis; electrical load analysis; thermal hydraulic analysis; criticality analysis; and environmental qualification analysis.

Beyond the methodologies and analyses discussed in the TICAP guidance it is expected that development of the Chapter 2 information will also serve as the location for other SAR material addressed by ARCAP guidance. This would include summaries of the site-related information and an analyses used to develop the design-basis hazard levels that would be documented in Chapter 6. So the development of the Chapter 2 information really needs to be integrated through use of both the TICAP and the ARCAP guidance.

Next slide, please? Moving onto the SAR Chapter 3 guidance; we're on slide 94 now, Chapter 3 documents the selection and evaluation of licensing-basis events using the LMP process as described in NEI 18-04. In addition to conventional single-unit reactor events, the LBEs include event sequence families that may involve multiple reactor units and non-reactor core radionuclide sources. The initiating events associated with LBEs include those caused my internal and external hazards reflected in the PRA as

well as those hazards addressed deterministically.

Chapter 3 will identify and describe the abnormal operational occurrences, AOOs, design-basis events, DBEs, and beyond-design-basis events, BDBEs, as determined from the evaluation of events sequence families. It is expected that these events are identified, tabulated, and categorized as AOOs, DBEs, and BDBEs and plotted on the frequency consequences target curve and show the data point uncertainties to demonstrate risk significance of the events.

The derivation of design-basis accidents, or DBAs, from the set of DBEs (audio interference).

Someone needs to put their mic on mute, please.

Again, the derivation of DBAs from the set of DBEs determined for the design will also be provided in this chapter. The descriptions of the licensing basis events provided in this chapter will be in sufficient detail to indicate the PRA safety functions involved in the prevention and mitigation of the LBEs such that the safety classifications for the specific SSCs performing these functions, including associated required human actions, can be determined. And those classifications will be determined in Chapter 5.

Just as a refresher the analysis of DBAs using the LMP process is performed in a conservative deterministic manner much the same way as currently done for Chapter 15 analyses for LWRs, meaning that DBAs credit only safety-related SSCs. The analysis for the non-DBA licensing-basis events using the LMP process is performed using best-estimate methods in accordance with the non-LWR PRA standard.

Safe stable end states are a key element of the reactor safety case and should be defined in Chapter 3. In LWR safety analysis reports it is generally understood how safe stable end states are defined, however for advanced non-LWRs the safe stable end states, including success criteria that are needed to achieve them, need to be defined for the specific technology and design. The plant parameters used to define the end states: core reactivity, reactor power, fuel temperatures, et cetera, will be in the chapter.

Chapter 4 documents the integrated evaluations that focus on overall plant risk performance and the incorporation of defense-in-depth. Overall plant risk performance is to be evaluated against the three cumulative risk metrics: the exclusion area boundary dose, EAB early fatality risk, and latent cancer risk.

Chapter 4 will also document the assessment of the adequacy of defense-in-depth for the plant design and will address the three focus areas for defense-in-depth. And they are: plant capability; programmatic capability; and integrated risk-informed performance-based defense-in-depth adequacy.

The baseline defense-in-depth adequacy evaluation results identified in this chapter and other SAR chapters are to be documented in sufficient detail to assure that proposed future changes to physical, functional, operational, or programmatic features of the facility can be effectively evaluated for their potential for reduction of defense-in-depth before proceeding with plant modifications.

Next slide, please? Okay. We're on slide 95. Chapter 5 documents the required safety functions, required functional design criteria, or RFDC, and principle design criteria, PDC, derived using the LMP process for the plant design. The required safety functions are identified as those necessary to prevent and mitigate unplanned radiological releases from any source with the plant.

Based on these required safety functions, risk significance, and contribution to defense-in-depth, the safety classification of the SSCs are

determined as either: safety-related; non-safety-related with special treatments; or non-safety-related with no special treatments.

In addition, this chapter will include the proposed principle design criteria for the plant design, develop and/or derived using the LMP process. Specific details and guidance for proposing PDC and the scope of PDC for non-LWR applicants under Part 50 and 52 has been a source of differing views among both industry and staff and there have been several PDC discussions during public meetings on the TICAP guidance. I'll have more to say about recent NRC insights and positions on PDC provided at our public meeting that took place on Tuesday of this week. There has been however no disagreement that there is a requirement for applicants to propose PDC for their designs under Part 50 and 52.

Yes, Member Brown?

MEMBER BROWN: You talked about the three categories. You said safety-related, safety -- SSCs with special --

MR. OESTERLE: Treatment. Yes, I'll go over those again. Safety-related.

MEMBER BROWN: Yes.

MR. OESTERLE: First is safety-related.

The second is non-safety-related with special treatment.

MEMBER BROWN: Okay.

MR. OESTERLE: And the third is not safety-related without special treatment.

MEMBER BROWN: Is this special treatment category similar to the RTNSS that we dealt with on the existing plants?

MR. OESTERLE: I would say that there are similarities between those two, yes.

MEMBER BROWN: Okay. I'm just trying to relate them from one -- what we did before and to what we're doing now. Is the RTNSS-type thought process, in other words, non-safety-related but -- I've forgotten what the RTNSS means now, so --

MR. OESTERLE: Oh, regulatory treatment.

MEMBER BROWN: Yes, right. Okay. Of non-safety systems or something like that.

MR. OESTERLE: So, yes, the concepts are similar, but the implementation details may be a little bit different. Under LMP there are some discussions of the types of things that are considered special treatments. One that jumps out at me is the actual inclusion of an SSC in tech specs with associated limiting conditions of operation is a

special treatment, a form of special treatment.

MEMBER BROWN: I'm kind of parochial since I do instrumentation and controls, so let me ask a question relative to my specific interests and how you would categorize. If a licensee categorized their plant such that their instrumentation control systems were not safety-related --

MR. OESTERLE: Yes.

MEMBER BROWN: -- would they be then considered under the non-safety but with special treatment? I have a hard time seeing if these things get tossed off as a FM radio sitting off on the side that people can listen to.

MR. OESTERLE: Yes.

MEMBER BROWN: I'm being a little humorous when I say that, but --

MR. OESTERLE: No, I appreciate the question. So no, there's not a correlation, a direct correlation that way. You really have to determine the function of your SSC first, and as a part of that function and/or its risk significance or contribution to defense-in-depth will determine its classification. In terms of risk significance and contribution of defense-in-depth, those are two areas that would cause a non-safety-related SSC to require special

treatments. And then the -- depending upon the required function and its support requirements to other SSCs would help determine the extent of special treatments applied to that equipment.

MEMBER BROWN: Okay. Thanks.

MR. OESTERLE: You're welcome.

So next slide, please? So we're on slide 96. Chapter 6 provides further detail on the criteria and capabilities of all safety-related SSCs determined using the LMP process. This further detail includes: safety-related design criteria, reliability and capability of performance-based targets, and special treatment requirements to provide sufficient confidence that the performance-based targets intended in the design will be achieved in the construction of the plant and maintained throughout the licensed plant life.

Chapter 6 also summarizes design requirements for non-safety-related SSCs that provide confidence that the non-safety-related SSCs will not adversely impact the ability of safety-related SSCs to support required safety functions in the event that a hazard occurs at the design-basis hazard level.

Yes, Member Brown?

Do you have another question or is that

your hand up from before?

(Pause.)

MR. OESTERLE: Oh, thank you.

Chapter 6 --

MEMBER BROWN: I forgot to take it down. And I forgot to un-mute my mic, so --

MR. OESTERLE: No worries.

Chapter 6 will include the design requirements associated with the design-basis external hazards as well as the overall design requirements for SSCs necessary to perform their functions. These would include things like SSC materials in construction, seismic and industry code classifications and design codes; for example, ASME, IEEE, et cetera, electric power support and interface requirements, control and instrumentation requirements, equipment qualification, et cetera. Chapter 6 also identifies the special treatments identified as necessary for safety-related SSCs to perform their functions.

Chapter 7 provides similar detail as Chapter 6, but focuses on the non-safety-related with special treatment SSCs and non-safety-related without special treatment SSCs; that is, the design criteria, reliability and capability targets, and special

treatments.

It is expected that Chapters 6 and 7 provide the bulk of design information, system descriptions, and design requirements for structures, systems, and components of the plant, and the fact that we manage to include both Chapter 6 and 7 on one slide here has no bearing on the volume of information expected in these chapters.

Next slide, please? So we're on slide 97 now. Chapter 8 provides an overview of plant programs relied upon to support the LMP-based safety case. This set of plant programs includes those used for special treatments for safety-related or NSRST SSCs, the non-safety-related with special treatment SSCs, as described in Chapters 6 and 7, respectively, that provide reasonable assurance that: (1) reliability and performance targets are achieved throughout the plant lifetime; and (2) safety-significant uncertainties are effectively addressed as part of defense-in-depth.

In addition to programs supporting special treatments Chapter 6 also identifies and provides an overview of the program or programs that document SSC reliability and capability targets -- I'm sorry, Chapter 8 identifies and provides those reliability and capability targets for those SSCs described in

Chapters 6 and 7. The discussion of plant programs would address the different plant lifetime phases; i.e., design, construction, testing, and operations, as applicable.

Examples of possible program topics include quality assurance programs, startup testing, in-service testing, in-service inspection, equipment qualification, performance monitoring, reliability assurance, conduct of operations programs, et cetera. Detailed guidance for developing these programs typically reside in other referenced guidance documents and this chapter would point to those.

Plant programs that do not support the LMP-based safety case; for example, as discussed earlier programs for normal operations such as ensuring occupational radiation exposure, they're addressed in separate ARCAP guidance which Joe went over this morning. Again, as Joe mentioned, the reason for this is that the LMP process focuses on off-normal plant scenarios; that is, AOOs, DBEs, and BDBEs. In general guidance for addressing normal operation will be addressed in or referenced in the ARCAP guidance.

So this concludes my discussion on the overall TICAP guidance. In the next few --

CHAIR PETTI: So, Eric --

MR. OESTERLE: Yes?

CHAIR PETTI: -- I have a question before you move onto the design criteria. So the old Chapter 15 stuff, is that in the chapter called Integrated Assessment?

MR. OESTERLE: So it is -- yes, part of it is in there. Part of it is in Chapter 3; part of it is in Chapter 2.

MEMBER BLEY: And why is that split up?

MR. OESTERLE: Well, the -- so as you recall the analyses in Chapter 15, those are the DBAs. And so there are more -- so the tools and the analysis methodologies and techniques for DBAs are discussed I believe we said in Chapter 2. Also the other tool used, the PRA, is discussed in that chapter as well. And so the results of those analyses are utilized in establishing design requirements and really discussed further in other chapters that focus more on those topics.

MEMBER BLEY: Okay.

MEMBER BROWN: I have a -- relative to that thought process of being split up, I mean today we've been reviewing on some of the new plants chapter-by-chapter basis just to speed up the process

before every chapter is complete. And it seems to me that if -- and I'm just hypothesizing here, that with these analysis pieces broken up between different areas that that's going to hinder the ability -- you're going to almost have to wait for the entire SAR to be completed before you can review it. Some of it is because a lot of these are interrelated to some extent.

CHAIR PETTI: I'm not sure that's true, Charlie. I'm looking at the -- I'm back on those slides.

MEMBER BROWN: Yes.

CHAIR PETTI: I didn't read them carefully enough. So I thought three was just the identification of the LBEs, but it's also the analysis. So they're going to identify them, kind of justify them, and show you the results. So it might actually be more efficient. I mean, I think that's the goal. I think it remains to be seen when we see one, but --

MR. OESTERLE: Yes, that is one of the goals.

CHAIR PETTI: Yes. I mean, as I look at the details here, the words -- there's lots of words, but it strikes me that it may make it more efficient

for --

(Simultaneous speaking.)

MEMBER DIMITRIJEVIC: And, Dave, I'm not really -- I see what you're saying and I see what Charlie is saying and I am totally confused how this is going to work. Because let's say that we describe the PRA in the Chapter 2 of the methodology. I mean, and I'm not sure in what details and how, but you can see it's actually being fully applied everywhere from there. You cannot select license basis events without the PRA because those are event sequences from the actually PRA.

CHAIR PETTI: Right.

MEMBER DIMITRIJEVIC: Then you come to the -- so now suddenly are we reviewing event sequences up to the level 3 in that Chapter 3? I mean, I am totally confused here.

CHAIR PETTI: I just think -- when I look at it it looks more -- organizationally you'd read from Chapter 1 to Chapter 2 to Chapter 3, whereas before the PRA was Chapter 19 long after the Chapter 15 events. This looks like it flows in a -- at least in a thought process that -- I mean, it follows LMP, but it sort of makes sense that you have to start with the PRA because that's the central part of the LMP.

MEMBER DIMITRIJEVIC: But are you -- when do you start with the PRA? I mean, you start what with PRA? You don't have a plant yet, you know? The things are building on the license-basis event on the safety structures and things like that. Suddenly we are start -- I am so confused I cannot even ask the questions. I mean, I have to see how this -- I always ask for the -- some really high-level example how that -- then we come to the safety classification where this is -- special treatment category is purely base on the importance of those things for the risk. So that is totally based on the PRA.

And I mean, this is this importance of these components is changing since the PRA is being completed. There's more data then as more as we know or -- yes, I'm just going to signed off here and just hope for the best.

MS. CUBBAGE: This is Amy Cubbage, NRC staff. I want to make it clear that the development of the SAR is going to clearly be an iterative process as design information is made -- becomes available, as the designer is developing the design, as they're developing their PRA. But once it comes to us it's final design information.

And I think as Member Petti basically hit

the nail on the head is that we intentionally put the chapters in these orders to have a more logical sequence of information and also recognizing that everything can't be first. Some chapters have to be first, but trying to put it in a logical sequence.

MR. OESTERLE: Yes, thank you very much for that, Amy. And I'll add that the focus of this guidance is on what information needs to go in the application. And the layout of the guidance and the organizational structure is driven by an applicant that is using PRA in a leading type of application to inform its design as we go.

And as Amy said, once we get the application in, there's going to be a high level of certainty on the -- let's say the design and the licensing-basis events, and we would say -- we would expect that the majority of, if not all of the iterations that you go through using the LMP process for your design will have been done by the time -- or before we get the application. So that will -- we will see a final product.

As far as how the -- how we would move forward in engaging the ACRS with reviews of applications, I think the structure and format of this SAR will change the nature of how that was done in the

past on new reactors, I think where we came to the ACRS on a chapter-by-chapter basis. So we'll have to take a look at that as we continue moving forward.

CHAIR PETTI: SO I was just --

MEMBER DIMITRIJEVIC: So this is --

CHAIR PETTI: Go ahead, Vesna.

MEMBER DIMITRIJEVIC: Yes, exactly what you just said important. This assume PRA in the leading role. That's true. And also assume that PRA is done, I mean, basically. You have it. It's structural. It's ready to go. So therefore, it seems to me like you assume that this work will be done and then presented. It's not really the -- so therefore -- but however, for review -- so when would they review the PRA? It's not going to be review under Chapter 2, which is just methodology --

MR. OESTERLE: Right.

MEMBER DIMITRIJEVIC: -- is it, before it goes in the next chapter. So this is where all this sort of like --

MR. OESTERLE: Yes, so thank you for that question. I think there's a couple of important points to bring out as a part of the review of this information. If we could, if we scroll all the way back to slide 76, the actual PRA is not being

submitted for NRC review. It would be available for audit. I believe the PRA standard requires a peer review. And it's those results and insights from the PRA that drive the design. And the establishment of the LBEs and the safety classification of the SSCs and determination of technical specifications and adequacy of defense-in-depth are those things that we will see in the SAR.

MEMBER BROWN: Well, the PRA is not --

MEMBER KIRCHNER: But, Eric, let me ask you a question: Let's go back to the current fleet and Chapter 15, which plays such a central role in your review. You review pretty much all of the methodologies that are used to do Chapter 15 analyses typically through topical reports. Did I hear you correctly saying that you weren't going to review the PRA when the PRA is foundational to the whole application you're receiving?

MR. OESTERLE: No, if I said that, I apologize. I misspoke.

MEMBER KIRCHNER: Okay.

MR. OESTERLE: What I said was that the PRA is not going to be submitted to the NRC. It will be available for audit by the staff.

MEMBER KIRCHNER: I don't get it. Why is

it not submitted?

MR. OESTERLE: It's not a requirement.

MEMBER KIRCHNER: Wait a minute. Wait a minute. You're basing this entire process on the PRA and you're not requiring them to submit it?

MR. OESTERLE: So --

MEMBER DIMITRIJEVIC: Yes, that's great.

MR. OESTERLE: So the --

MEMBER KIRCHNER: It's almost stretches one's credibility. Come on. The whole thing is based on the PRA.

MR. OESTERLE: So if we go back to, you know, the Part 50 and 52 regulatory framework, you know, this among others, are some of the challenges that we see in fitting the LMP process into the established Part 50 and 52 regulatory framework.

MEMBER KIRCHNER: Wait a minute, wait a minute, wait a minute. 50 and 52, that's a supplemental thing to put a PRA on the table.

That's, what we're doing here is completely different. We're starting with the PRA as the whole entire licensing basis. Completely different.

The licensing basis primarily for 50 and 52, is Chapter 15.

MR. OESTERLE: Right. And so I'll reiterate that the design basis accidents for an LMP based application, are performed using the conservative, deterministic approach that is the same as what was done under Chapter 15.

It's the other non-DBA licensing basis events, that are evaluated using the best estimate methodologies of the PRA.

MEMBER KIRCHNER: Yes, but you're using, let's pick on something --

(Simultaneous speaking.)

MEMBER BLEY: Hey, Walt --

MEMBER KIRCHNER: -- specific. You're --

MEMBER BLEY: -- Walt? Could I --

MEMBER KIRCHNER: Yes?

MEMBER BLEY: -- jump in and say something and then --

MEMBER KIRCHNER: Yes, you can go.

MEMBER BLEY: -- you go ahead with your questions.

Because submitting the PRA given its complexity, and is problematic. And what I mean is they can write a report, well right now they do write a summary report, which is the Chapter 19.

They have all their event trees and fault

trees if that's the methodology they're using for the PRA. And the best way to review it is to sit down with them and exercise the model, and look into the details, and chase down various scenarios.

Staff does that through these audits. And we've done it before through the same kind of auditing approach.

To get a hard copy of it to submit isn't the best way to do the review. So I'll let them talk more about it, but I just wanted to get that across.

They have it; it's available to look through to exercise with them to make sure all of the pieces fit together; look at their data sources; and look at the whole model, and make sure it's reasonable.

Not just reasonable, but it doesn't have errors throughout the fault trees and event trees, if that's the way you're doing it.

MEMBER DIMITRIJEVIC: And it doesn't reflect reality then. The question is not how do you do review, the question is when. And, you know, and do you start the review of all of SAR without PRA audit?

It doesn't matter how you review it. Even question is do you review it, because Walter is right.

All, everything, the basis of the type of hydraulic analyzes selection of sequences, selection of the safety systems, selections of the special treatment.

Everything is based on the PRA suddenly. It's not the PRA based on reality. Reality is based on PRA.

Things have you know, become a very complex and what just said, call for the best, which I want to say maybe in the end, that will all work together somehow good.

But in this moment, it is confusing for me, so.

MS. CUBBAGE: This is Amy Cubbage, NRC staff.

We also don't want to lose sight of the fact that we are working on endorsing a non-LWR PRA standard, and maybe Marty Stutzke could chime in on that activity.

We also highly encourage applicants to engage with us during pre-application, on their probabilistic risk assessment.

Certainly if they're not planning to follow the Perry standard, they need to be talking to us very early on, on how they intend to demonstrate that their PRA is technically adequate for the

application at hand.

And we're also encouraging that the PRA be made available to audit to the NRC staff in advance of the application, because it is so central to the development of the other parts of the application.

So with that, Marty, did you want to chime in?

MR. STUTZKE: No, I mean I basically agree with what you say, and remember that Reg Guide 1.247 will be out for trial use in a couple of months, like the (audio interference).

That's it.

MR. OESTERLE: Thank you, Marty, thank you.

MEMBER DIMITRIJEVIC: There was just some short comment.

This standard tells them what needs to be done, not how to do it. So they have to choose how to do it.

Did they make that selection, that's not what that standard tells then. Standard only tells them this what you need to be, to do to have a good PRA. Not how to do it.

MS. CUBBAGE: Right. And the NRC staff will be auditing the PRA. And if it's determined to be insufficient, then it would not be sufficient to

support the application.

So we need to recognize that the NRC will have an oversight role here.

MEMBER BROWN: But you also have to have a plant design under, that's covered under Chapter 5, 6, and 7, I think it's 7, so that you can even develop the sequences that you need under a PRA.

MS. CUBBAGE: That's right.

MEMBER BROWN: I'm kind of lost. I --

(Simultaneous speaking.)

MS. CUBBAGE: This is --

MEMBER BROWN: Chapter 1 is site evaluations, and earthquakes, and tornadoes, and hurricanes, and all that stuff. You can do that similar to what we do today.

But it seems to me that for instance, the principle design criteria, there aren't any. They'd have to be developed with part of Chapter 5, according to the structure that you laid out. That's on slide 96, or 95, excuse me.

So it's whereas existing plants today start with a set of general design criteria, and this makes it look like there are none. You have to look at the plant, and then figure out what they are.

I don't have a problem with that, but

you've got to have a plant design to figure out what you're design criteria are going to be, or what's required.

MS. CUBBAGE: Yes, all of that needs to be done. We need a design, we need a PRA, we need principle design criteria, and there will be an interactive process by which the developer comes up with that.

Ideally with some level of re-application engagement with the NRC staff, to make sure they're headed in the right direction. But yes, this is not, this is not easy. It's not trivial.

MR. OESTERLE: Well, all of the plants have a reactor, all of them have a cooling system of some kind.

All of them have monitoring and instrumentation. All of them have various other types of systems that support the shutdown, or operation, or criticality control.

And all of those are wrapped up in Chapter 5, where a lot of them were kind of separated if you look at it, in the older system.

I'm just, I'm like Vesna. I'm having a little bit of difficulty how this, we're going to do piece parts of the Chapter 5 and 6, before they're

complete?

MS. CUBBAGE: So I think if the concern is just the organization of it, you know, maybe we can take that back and figure out a way to explain it better.

But you know, at the end of the day, we're trying to make sure that all of the appropriate technical topics are covered, in order to support the ability of the staff to make a finding. A reasonable assurance of adequate protection once the application is submitted.

MR. OESTERLE: So, Amy, I --

(Simultaneous speaking.)

MEMBER BLEY: I think there's some confusion here --

MR. OESTERLE: Yes.

MEMBER BLEY: -- about what, when an applicant will submit and what will be here. And I think maybe the staff can explain that.

When they submit their application, will all these chapters be in it, and I --

(Simultaneous speaking.)

MS. CUBBAGE: Yes.

MEMBER BLEY: -- and the answer is yes.

MS. CUBBAGE: Yes, yes, you have to. Yes.

MEMBER BLEY: Sounds like we're thinking that won't be what happens.

MR. OESTERLE: Absolutely, yes.

MEMBER BLEY: And it really is.

MS. CUBBAGE: So you have to have all of the chapters of an FSAR, addressing all of the regulations at the time of submittal, in order for an application to be docketed as sufficient for the NRC staff review.

MEMBER BLEY: So this iterative process you described will go on by the designer, and with, we expect with interactions with the staff, before a formal application is submitted?

MS. CUBBAGE: Yes. The iterative process is developing the design, and in turn, developing the application that is submitted to the NRC in its entirety.

MR. OESTERLE: Yes, and I would add --

(Simultaneous speaking.)

MEMBER BLEY: So --

MR. OESTERLE: -- I would add that the, you know, we would expect that the iterative process that the designer goes through in the design, and in the PRA, is completed before this, the application is finished and submitted to the NRC.

So the iterative process is not between the designer and the NRC. Most of that iteration takes place in the designer's house.

CHAIR PETTI: Right. And is there any plans by industry to provide sort of a, some sort of higher level example in an appendix or something of TCAP?

MR. OESTERLE: Yes, so great question, thank you.

There are some examples in, I believe it's appendix, one of the appendices to NEI 2107, that show the level of detail that would be provided for the different types of licensing basis events.

There's one for an AOO. There's one for a DBE. There's one for a BDBE, and I believe there's one for a DBA, as well.

So the answer is yes.

In addition to that, there were you know, several table top exercises performed with, on implementing the TCAP guidance and before that, the LMP with several, several advance reactor developers to test drive the process.

CHAIR PETTI: Yes, so let me just. I wasn't on the committee.

Dennis, did we, did the committee hear any

of the results of the table tops, to kind of take this from the abstract to the more specific?

MEMBER BLEY: We had briefings on at least one, and maybe two of the table tops, that were you know, partial exercises of the process.

We received copies of the reports of maybe four or five of them. Not all of them carried the process all the way through.

But as far as briefings, they came as we were looking at LMP I think, as part of those presentations by the industry. Maybe somebody on the staff remembers better than I do of those.

But we do have records of that in our minutes, and in the reports that were submitted. And Derek maybe can help us on that, too.

CHAIR PETTI: Okay, no, that's what I thought happened.

MR. OESTERLE: Yes, we do have links, links to those table top exercise reports on our public webpage under the advance reactors, and the licensing modernization project page.

MS. CUBBAGE: Yes. Yes, to add to that Eric, just to make sure it's clear and I think Dennis got to the point that there were table tops on LMP, which were discussed with the committee --

MR. OESTERLE: Yes.

MS. CUBBAGE: -- and then there have been table tops on TCAP more recently.

MR. OESTERLE: Correct, correct.

CHAIR PETTI: So the question, one question that I still have, and again, I don't, you don't have to answer it now but be something to think about.

Is the three pathways that Marty talked about yesterday, versus TCAP and RCAP being so LMP focused. Is there a hole there now if someone wants to go with PRA not in the leading role? Or the maximum accident?

Does the SAR look the same, does it look different? Are all these stuff in the orange box still required?

That's the only thing that to me, I haven't been able to close in my mind.

MR. OESTERLE: Yes, that a good question, and thanks for that.

So we are closely coordinating with Marty on guidance development going forward you know, with the TIRIMA approach. So I think it's too early to answer your question.

MR. OESTERLE: Right, but there's something, there could be another iteration coming, is

what you're saying potentially.

MR. OESTERLE: Right, right.

MR. OESTERLE: Okay. Go ahead, I see lots of hands. Vicki, your hand's been up for a while.

MEMBER BIER: Yes, I just want to kind of reiterate, and maybe put words in people's mouths a little bit, based on what I was hearing.

The question that I have is do you feel that submitting the PRA is really unnecessary and not beneficial, or do you feel that ideally, you would prefer to have people submit the PRA, but your hands are tied by current regulation so that you can't require it?

MR. OESTERLE: So I'm not quite sure how to answer that question without separating a personal opinion from staff position. So I will defer to others.

MS. CUBBAGE: Maybe I'll chime in. This is Amy Cubbage.

In the original Part 52, it was required that the PRA be submitted. I was the project manager for ESBWR, some 10,000 pages of information was submitted.

More recent design certifications fell under the current PAR 52 rule, which did not require

the submittal of the PRA. However, the staff was still able to reach the same findings, and had access to all the information it needed to make those findings.

That said, as we move forward to Part 53, it's still under development as to what information will be submitted.

But I surmise it will be similar to the current requirements under Part 50, where the applicant will submit a description, and provide the insights, and describe how it's been used.

So from my personal opinion, it's certainly not a matter of hands being tied.

MEMBER BIER: Thanks.

CHAIR PETTI: Oh, sorry, Ron? Go ahead.

MEMBER BALLINGER: Yes, now I'm thinking more along the lines of what Walt has been saying.

I heard Amy use two phrases. Available for audit, and will be audited. And this is the nub of the problem because now the, because the PRA is so central, the adequacy of the PRA will be a very strong function of the extent of the review now by the applicant.

In other words, the peer review, if you want to use that term.

And so I think we need to be very careful in this case, which is it? Available for audit, or will be audited?

MR. OESTERLE: Thanks, Member Ballinger, I appreciate that distinction and the question. And so I'll reach out to Marty Stutzke to see if he has any comment on the adequacy of the PRA, and its determination through peer review. Or NRC audit.

MR. STUTZKE: Yes, my first impression is if the PRA has not undergone a peer review, then we will do an audit, an on sight audit to the level that we need to, to confirm the acceptability of that PRA.

On the other hand, if a peer review is done, and they submit all the facts and observations and the resolutions, that audit may not be necessary.

MEMBER BALLINGER: But it would seem to me that now the review should include an audit, if you will, of the peer review. Because that's what the whole foundation of the thing is predicated on that peer review being performed adequately.

MR. STUTZKE: Yes, and we would expect to do that. Moreover, we may observe the actual peer review process.

MEMBER BALLINGER: Ah, okay. So maybe is that codified anywhere in any of these documents?

MR. STUTZKE: No, not yet.

MEMBER KIRCHNER: I would submit, Marty, this is Walt.

With all due respect to peer reviews, there are problems in doing peer reviews to the extent, well, one, these are, these designs by and large, are going to be proprietary. That presents a whole set of problems.

The people who are chosen for the peer review, one would hope they're a very diverse group with all kinds of expertise, et cetera, et cetera.

I haven't looked at the standard to see what the requirements are for the peer reviewers, but it's not being done in the open.

So my, given the fundamental nature of the PRA to this entire approach, I would expect at a minimum, you would audit the adequacy of the PRA.

Which is a little different than, in other words, to make sure it really does conform with the standard, and then as Dennis suggested to me, and I appreciate Dennis' point. The description, I think the current requirements in 52 are description and insights, if I remember it correctly.

I may not be, but you had a chart, Marty, that said what was required. I get it. That's

probably the best way for the staff to start the review of the actual results of the PRA, and how they filter into making all these decisions about LBEs, and then classification of equipment as such.

But given the fundamental role of the PRA, I just, I think at least that audit would be a requirement.

MEMBER BLEY: I'd like to jump in on that, Walt.

And I don't disagree with that, I think that's important. But Amy triggered a memory.

Back when we did ESBWR, they had submitted a printed version of the PRA, and on if you want 1,000, we also had access to a printed version.

And one of the problems we ran into, and I'm sure the staff hit the same problems, was we'd look through the model and start raising questions about, you know, if this logic isn't right.

And as soon as we'd start, the applicant would say, you are absolutely correct and we corrected that. But it wasn't in the current printed version.

We've run into that with REIs, REIs and things. And here, they have to bring in their model and let us, and I think the staff as well at that time, see what was there now, and raise questions

about it, and work through it.

And that kind of audit works very well. The trying to deal with a printed version while things are in flux, is, was very, very difficult. It didn't work well.

MEMBER BALLINGER: I'm thinking that the ultimate review was on the APR1400 where we actually were down, well, not we, but somebody, a member, was down at their office working through it and --

(Simultaneous speaking.)

MEMBER BLEY: We did that on three of them, Ron.

MEMBER BALLINGER: Oh, okay. I was more familiar with the APR1400.

MR. OESTERLE: It looks like there are other hands up as well.

CHAIR PETTI: Yes, Joy?

MEMBER REMPE: Sure. I can appreciate as a regulator saying okay, you guys do your PRA, iterate on the design, get it where it needs to be, and then come in and see us.

But I'm wondering how the design developers are taking this. Because you know, I've already seen other documents where there's concern about they can't get any sort of regulatory approval

early on to. And my take on it is that's how they secure additional funding from their investors.

And this is really going to require front load funding on their part. Are they taking this well?

MS. CUBBAGE: Actually, Joy, this is Amy Cubbage.

To the contrary, we are strongly encouraging those pre-application engagements, and would gladly provide feedback to someone who wanted to engage with us during the pre-apps.

So I wasn't quite following your thought there.

MEMBER REMPE: Pre-app's one thing, but when you start coming in with topical reports, or chapters --

(Simultaneous speaking.)

MS. CUBBAGE: Well, that's what I mean --

MEMBER REMPE: -- and --

MS. CUBBAGE: -- topicals.

MEMBER REMPE: Yes, well, that's a little more. That's a more substantial review.

But I guess I'm just thinking that it's going to take a lot more funding on their part to get their design finalized.

Because I know with a lot of the other plants, we'd see design changes in process because of comments, as we went through the chapters.

And after they've spent all the money to get their PRA, and get their design finalized and then come in, I guess my question, and maybe I'm wrong, is that this is going to require more front load funding on their part. But you don't think it will. So maybe I'm wrong.

MS. CUBBAGE: Yes, I'm not quite following. I can't. Okay.

MR. OESTERLE: Well, so I'll jump in.

So I think some of the insights on that can be gleaned from the fact that during the, and I think you've heard this, that during our stakeholders' discussions on Part 53, some of the feedback that we got from industry was, you know, don't require as part of Part 53, that a PRA be, is necessary because some of the designs may be very simple, and not complex and that a PRA is not you know, worth sinking the money and time into.

So there are various opinions about PRAs out there in the, to aspects of necessity for the design. Or the flexibility and insights that it provides, as part of the iterative design process.

MEMBER REMPE: So years ago when I was working for a gas cold reactor design that came up with a preliminary safety information document, we used to, some of the workers would laugh about having a transient design, because the PRA would identify something, the design would change. And we'd go back and forth.

But we were bankrolled by a Department of Energy funding source. I'm just thinking if some of these designs aren't, I'm not sure if they'll have the funding to accommodate this approach, is I guess my gut feeling when I first hear this.

But I'm just curious about it.

MS. CUBBAGE: Yes, at the end of the day, these are not easy things to do. Many of the developers are receiving substantial DoE funding.

And for those that don't have enough funding to develop a safety case, then they're probably in the wrong business.

MR. RECKLEY: But Joy, this is Bill Reckley.

Just to your point, this is really, I mean and what you describe is, is really a designer trying to pick a fairly linear design process, or an iterative design process.

And there's pros and cons to both of those. The linear tends to be a simpler process, but even those if you want to say that the current Part 50 structure with the general design criteria and so forth, is a fairly linear process, I think all of us who have lived through this would understand that all of the designs even that went through that process, went through quite a few iterations, as you start to introduce other factors like cost, and changes into the energy sectors, and so forth.

So just as Charlie mentioned earlier, even in an iterative process you have to start somewhere, right? And they have designers are basically going to have some significant aspects of their design, kind of decided upon when they enter into the process.

So, yes, it's complicated as Amy said. And our ability to accommodate I think, either that linear design process, or a more iterative process, is what we're, is what we're now kind of settling in on through these various options that we talked about over the last two days.

MEMBER REMPE: Again, I don't have all the answers, I just was curious what some of the design developers are saying and if they're --

(Simultaneous speaking.)

MR. RECKLEY: Well --

MEMBER REMPE: -- receiving this well.

MR. RECKLEY: And as Amy said, we're hearing a mix, right? The advance reactor demonstration programs, are using this kind of approach.

Now, those designs are benefitting from, from you know, relatively long history, and I'll, and many years of iterations associated with both gas cooled, and sodium cooled reactors.

There are other designers as Eric mentioned. Especially some of the smaller ones who think a more linear process might work for them.

So, you know, part of our problem is we're not hearing a single voice on this. There are different parties with different preferences on how this will go forward.

And it's understandable from different designer standpoint, they're just coming up with different conclusions, and different preferences.

MEMBER REMPE: Well, our only concern is safety, and you can get there with this approach. I just was curious.

MR. OESTERLE: Yes, and I'll add to that. Our focus here is ensuring that you know, we have the

minimum set of information included in the application necessary for the staff to do its review, and arrive at its findings on safety and reasonable assurance.

And that the audits do play a part in that process. And some of what has happened in the past is that the audits of applicant information, has resulted in additional information being included in the application.

CHAIR PETTI: So, Vicki, you have your hand up. Is that from before, or do you have another question?

MEMBER BIER: No, sorry, that's from before.

CHAIR PETTI: Eric, I mean given we're kind of slipping behind the schedule, why don't we move on to the principle design criteria?

MR. OESTERLE: I'm okay with that. I believe we're on slide 98.

Okay, thank you very much.

So like I had mentioned earlier, the development of guidance for an LMP based approach for proposing principle design criteria, or PDC, has been the subject of ongoing stakeholder interactions.

The most recent discussion on this topic occurred during our December 14 TCAP public meeting.

And we talked about the applicability of the general design criteria in 10 CFR 50, Appendix A, to non-light water reactors.

We talked about what guidance is out there for developing proposed PDCs for advanced reactors. And the possible need for exemptions from regulations, when developing PDC for advanced reactor applications using the LMP process under Part 50 and 52.

So I'll provide a summary of these discussions on these points in the next few slides. So if we could go to the next slide, please.

So we're now on slide 99. And as you can see here, there's a list of requirements in the regulations, where PDC are required to be proposed by applicants under Part 50 and Part 52.

It should be noted that the NRC is considering including other regulatory constructs in the Part 53 rulemaking, to ensure that appropriate functional design criteria are developed through which an NRC finding could be made.

Based on the regulatory history, PDC are a means to meet the requirements of the Atomic Energy Act, Section 182, for inclusion in license applications of, and they quote from the specific characteristics of the facility, and such other

information as the commission may, by rule or regulation, deem necessary in order to enable it to find that utilization or production of special nuclear material will be in accord with the common defense and security, and will provide adequate protection to the health and safety of the public.

So next slide, please.

So the discussions that we had on PDC and GDC, what we said were that the general design criteria in Appendix A to Part 50, are applicable to LWRs as minimum requirements. However, they provide guidance to applicants for other types of nuclear power units.

We also discussed the fact that there are advanced reactor design criteria that were developed and endorsed, in the NRC Reg Guide 1.232, that were intended to provide insight into the staff's views, on how the underlying safety bases for the GDC could be applied to address non-LWR design features.

And as noted in that Reg Guide, the development of the ARDC was an important first step to address the unique characteristics of non-LWR technology.

But we recognize that there were future benefits of risk informing those known LWR design

criteria, and determining the role of such criteria within a new regulatory framework.

Next slide, please.

So we're now on slide 101.

During our stakeholder interactions on TCAP guidance, a question was asked as to whether the description of the highlighted statement that appears in the introductory section of 10 CFR 50 Appendix A, applies to advance non-light water reactors.

And so it really was, is that description a printable design criteria part of the regulation, is it a requirement.

And we determined that, the NRC determined a position on the requirement for proposed PDC is that it includes the scope of PDC described in the regulations, and it's also described in the regulatory history. And it's that italicized statement.

And we highlighted certain portions of it as we used that to define the scope of PDC.

So we believe that PDC are particularly important for construction permit applicants. Of course, they're important for other applicants as well.

But the focus on CP applicants here, is that PDC were more important because there were fewer

overall requirements for CP applicants, comparatively speaking. And those requirements that were there only called for preliminary information as a minimum.

This second bullet does not mean that CP applicants need to provide less information for their PDCs.

This comparison just highlights the significance placed on the PDC, for a construction permit.

And as such, it follows that proposed PDC play a significant role in supporting the NRC's finding that there is reasonable protection, sorry, reasonable assurance that safety questions will be satisfactorily resolved, and that the proposed facility can be constructed, and operated at the proposed location, without undue risk to the health and safety of the public.

CHAIR PETTI: Eric?

MR. OESTERLE: Yes?

CHAIR PETTI: Just a question on the concern that was raised. Was the concern that they didn't think one needed PDCs or --

(Simultaneous speaking.)

MR. OESTERLE: No --

CHAIR PETTI: -- was it something about the

particular language? I mean, I read it and go, well, of course, you know?

ELL: Well, no, great question, great question.

So there was never a, any kind of a difference of opinion as to the requirement to proposed PDC.

The question was on, once we agree that PDC are required to be proposed, what do those PDC need to include? You know, what are the scope of those PDC?

CHAIR PETTI: Okay.

MR. OESTERLE: And so our position was that well, the PDC need to address the necessary design, fabrication, construction testing, and performance requirements for SSEs important to safety.

CHAIR PETTI: Thanks.

MR. OESTERLE: Thanks for the question.

So I think we're ready to move to the next slide, please.

MEMBER KIRCHNER: Just a minute, Eric.

MR. OESTERLE: Yes.

MEMBER KIRCHNER: So it seems to me on the PDC discussions, do you envision that this would be one of the primary, no, poor choice of words, one of

the first major items that you would do a pre-application interaction with the applicant on?

MR. OESTERLE: Yes. In fact, we have already seen that at work. We've already had some pre-application interactions with applicants on their proposed PDC.

And I can refer to Kairos as being one of those in which they submitted a topical report, and we reviewed it and performed a safety, issued a safety evaluation report for their proposed PDC.

So, yes, we do anticipate that this would be one of those you know, say you know, leading variances --

(Simultaneous speaking.)

MEMBER KIRCHNER: Yes, it would seem to me that if you can't get to closure on this, then it would be tough sledding --

MR. OESTERLE: Yes.

MEMBER KIRCHNER: -- for the rest of the application. Ditto things like quality assurance that --

MR. OESTERLE: Yes.

MEMBER KIRCHNER: -- would be -- come after the PDC delineation.

MR. OESTERLE: Yes, yes, your instincts are

right on in that respect.

So if we could go to the next slide, please.

Thanks.

So we're on slide 102.

Proposed PDC determined to be necessary for a non-LWR, and submitted in an application under 10 CFR Part 50, or 52, should be as comprehensive in scope as the GDC and ARDC.

And that is the scope as we defined previously, establish the necessary design, fabrication, construction testing, and performance requirements.

So we kind of look at this as like a two-step process. First, you determine which PDCs are necessary for the required safety functions, that you need to ensure in your design.

Then, once you've established those, you look for those SSCs that perform those functions, and ensure that the scope of the PDC then cover those necessary areas, design, fabrication, construction testing, and performance requirements.

Yes, Member Brown, I see you have your hand up.

MEMBER BROWN: Yes, when you, that first

bullet when you talk about as comprehensive in scope as the GDCs, I presume you're talking about Appendix A?

MR. OESTERLE: Yes, I am.

MEMBER BROWN: Okay, just it wasn't specified. I didn't know that was more generic, that's why I asked the question.

MR. OESTERLE: Okay, thank you.

MEMBER BROWN: I asked the question because when we were doing this back in some of the earlier meetings, I went back since I'm, since I'm not as versed in the commercial world, and looked at all the GDCs and it appeared to me that all, like two-thirds or more of them would apply to any design you came up with, because they were so generic in terms of safety implications.

So that's, I've been emphasizing that along the way.

MR. OESTERLE: Yes.

MEMBER BROWN: So I just wanted to make sure they were still included as part of the stuff to be considered.

So thank you.

MR. OESTERLE: Yes, yes, thank you.

And that was one of the things that we did

identify in our discussions, is that the guidance should say that applicants should look at the GDC and ARDC, as guidance in developing their proposed PDCs.

And, in fact, the development of ARDCs, which was endorsed in Reg Guide 1.232, in fact, did that very exercise.

So the --

(Simultaneous speaking.)

MEMBER BROWN: I remember that, thank you.

MR. OESTERLE: You're welcome.

So --

(Simultaneous speaking.)

MEMBER KIRCHNER: So from a process standpoint, Eric, do you envision --

(Simultaneous speaking.)

MR. OESTERLE: Yes.

MEMBER KIRCHNER: -- do you envision that once you had reviewed the applicant's PDCs, then you would use those much like you used the GDCs, and 0800 as a fundamental, what should I say, foundational basis for reviewing the --

MR. OESTERLE: Yes.

MEMBER KIRCHNER: -- that specific part of the application?

MR. OESTERLE: Yes, that's correct.

MEMBER KIRCHNER: It's system.

MR. OESTERLE: That would be our, yes, those would be those, the approved well, approved proposed PDC would become then the foundational benchmarks for which the NRC, then would establish its findings in the safety valuation report.

And there's even been some discussion about for construction permit applications, including those approved proposed PDCs in, in the construction permits as license conditions.

Member Brown, your hand is up. Is that do you have a new question, or is that from before?

MEMBER BROWN: I just forgot.

MR. OESTERLE: Okay.

MEMBER BROWN: Thank you, thank you.

MR. OESTERLE: No worries.

So we also discussed that our position that non-LWR applicants proposing PDC, that do not fully address the scope of PDC as shown there in the parenthesis, will need to request exemptions from the applicable regulations.

And, again, those regulations were on a previous slide. And the discussion around that centered on well, is it a full exemption, or is it a partial exemption?

And I think we landed on that it was just a partial exemption. Because no one is arguing the fact that there is a requirement to propose PDC.

Non --

(Simultaneous speaking.)

CHAIR PETTI: So Eric, just a question.

MR. OESTERLE: Yes.

CHAIR PETTI: So if an applicant came in and wanted to do a prototype, would some of the testing and performance requirements sort of be exempted, in terms of having to have it done, you know, before the CP, but committing to doing it somehow during operation?

MR. OESTERLE: You know that's an interesting question and gosh, I don't have a lot of insights on the requirements for a prototype, so --

(Simultaneous speaking.)

MS. CUBBAGE: I would --

MR. OESTERLE: -- I would defer.

MS. CUBBAGE: Yes, I can chime in, Eric.

MR. OESTERLE: Thanks.

MS. CUBBAGE: I think these are different types of tests.

So no matter whether it's a prototype, a test reactor, or whatever the case may be, there's

certain SSEs that we're relying on to make our safety conclusions that that facility is protective of public health and safety. And that the PDCs would have tests to demonstrate those features.

For a prototype, what we're doing is we're making a finding that the facility is safe within the constraints of what we're approving, with the understanding that that facility could be used to generate additional data, that then could be used to further expand the operating conditions later on.

It's a whole larger conversation on prototypes. But ultimately, we're going to make a safety finding that a prototype reactor is safe, and that whatever SSEs are relied upon to ensure safety, would have appropriate testing requirements through the PDCs.

I don't know if that helped, but we could have a whole other conversation.

CHAIR PETTI: Yes, I mean it's probably a much larger conversation at another time.

MEMBER BROWN: Dave, just for amplification, all of, I can't speak for S1W, I don't know what happened with that one, but all of the Navy's subsequent prototypes actually underwent a review. They were all, underwent a review with the

AEC, and then NRC subsequently. So before they were put in service.

So there's been a history of prototypes for big reactors, light water reactors --

(Simultaneous speaking.)

MS. CUBBAGE: Yes.

MEMBER BROWN: -- of being --

MS. CUBBAGE: And there were --

MEMBER BROWN: -- fully reviewed, fully approved before they went into service.

MS. CUBBAGE: Yes, yes.

So the word prototype has been used in different contexts, in different arenas. But you know, whatever the NRC licenses, be it a prototype or a non-prototype, we will be making a full safety finding on that facility.

MEMBER BROWN: And that's good to hear. Thank you, Amy.

CHAIR PETTI: Keep going, Eric, sorry.

MR. OESTERLE: Okay, thanks, yes, no problem.

So non-LWR applicants must provide supporting information that justifies to the NRC, how their design meets their proposed PDC, and how their proposed PDC demonstrate reasonable assurance of

safety.

And so this bullet gets to the question that Member Kirchner asked, that the approved proposed PDC would kind of be the benchmark for the NRC's finding.

NRC believes that it is feasible for applicants for construction permits, COLs, design certifications, SDAs, and MLs, to provide justification for an exemption, or partial exemption from PDCs when ensuring that the elements of the PDC's scope, not fully addressed in their proposed PDC, are included elsewhere in their application.

And I would add that it may be more challenging for CP applicants as there are fewer overall requirements for CP applicants, as previously mentioned, that could be relied up. And those only asked for preliminary information.

But having PDC provides both for a flexible, and a structured licensing approach for construction permits, such that having basic criteria against which to judge the application, moves the application review beyond opinion to a structured an orderly process.

So next slide, please, and this will be my last slide.

The TCAT guidance document 2107, proposed an approach to supplement PDC, that were focused strictly on safety related SSEs with proposed complimentary design criteria that focused on the non-safety related with special treatment SSEs.

And in looking at that approach, this is one of those areas, that we felt like it was one of those challenges in fitting the LMP process into the existing Part 50 and 52 regulatory framework, that only addresses principle design criteria.

And we determined that both PDC and CDC, would need to be relied on by the NRC in making its regulatory finding.

We suggested that a two-tiered PDC approach could work. And we are anticipating further stakeholder interactions on this topic and others, at the next public workshop in January.

And so I apologize, this is not my last slide, but it was my last slide on the principle design criteria discussion.

If we go to the last slide, this will complete it.

So these are the next steps that we're looking at.

Updating the draft guidance documents.

We're working on that this month. We are continuing our discussions on drafting exceptions clarifications and additions, to the NEI 2107 guidance document. And we're working to resolve as many of those as possible.

We anticipate another public workshop on TCAP with industry next month, and in the interim, we'll be exchanging information to try to continually make some progress on these moving forward.

So with that, that concludes the TCAP and RCAP discussion.

CHAIR PETTI: Thank you, Eric. I have two questions.

MR. OESTERLE: Sure.

CHAIR PETTI: One for you, and one for my colleagues.

One, do you anticipate coming back to us with sort of another round on where you are after these industry interactions, and you actually have the documents issued for public comment?

MR. OESTERLE: So this is how I would answer your question is that we, as part of the process for turning these white paper guidance documents into formal draft guidance documents that we would issue for public review and comment, there is a part of that process, an opportunity for the ACRS to

review those.

And if you and the subcommittee desire to do so, you can reach out to us through Derek.

MR. WIDMAYER: So this is Derek. Hey David, those are already on the potential schedule.

CHAIR PETTI: Okay, I mean I remember knowing that we had put something out there. That's what that was for.

MR. WIDMAYER: Yes, we may be having to adjust, depending on how the staff does with meeting their schedules. But, they are actually already scheduled right now.

CHAIR PETTI: Okay, okay.

And so the comment to my colleagues is, this is a pretty large set of documents and it covers a heck of a lot of stuff.

Initially, I thought we'd want a letter on this. But I'm getting less convinced of that just given the breadth and depth of it, that it could be quite a task for us. And I just wanted to get some feedback from colleagues here.

MEMBER BLEY: Well, I'll jump in, Dave.

I suspect we need some kind of letter but you're right, it is a broad set, and maybe an overview and is you know, identifying if there's anything we

think is significantly missing, or kind of wrong-headed.

And the other would be identifying particular pieces of this guidance that we might want to do a deep dive on, and like particular letters.

And I don't know I think you're going to need a session sometime just to talk through that with the group.

CHAIR PETTI: Yes, okay.

MEMBER BROWN: Would it be, this is Charlie. Would it be, I mean we're covering some Part 53 stuff and earlier, and now we've got the key CAP/RCAP summary of where they stand today.

Is this a three-piece or two-piece type letter? I'm trying to struggle like you are, as to how we would put that together now --

(Simultaneous speaking.)

CHAIR PETTI: Yes, so --

MEMBER BROWN: -- because that's more public.

MEMBER BLEY: And remember this applies to both 5052, which license change we're going to be dealing with soon, and to Part 53.

CHAIR PETTI: Yes, yes.

No, I like your thought Dennis. That was

my sense. At best, we'd probably do an overview, and then just highlight anything that we think is an issue given the breadth here.

But yes, and Charlie, our future if we write Part 53 letters, they will be topic focused. So everything we heard yesterday on the training will be a letter.

I think there will be something on this three phase approach/PRA that Marty presented, but we're going to wait until we get the white paper. I think that will be the trigger for us to decide then to put pen to paper, if you will. Because those are important.

So I just wanted to get people's sense, so. You know, I've been taking great notes so I, you know, I've got it in my head. So I just want to make sure that others agree that that's worth doing.

And I think the 5052 nexus here, is another important reason probably to do this because of its applicability.

MEMBER DIMITRIJEVIC: And, Dave, what then is also mention I will support that we have a sub-group, you know, meet internal among us meeting, too.

CHAIR PETTI: Yes, no, I think we'd need to figure out something, yes. So any other comments,

questions for folks?

I'm going to thank you, Eric and Joe. It was a good, good discussion this morning.

As I knew the whole part 53, we're really getting to the nuts and bolts and it's been a really valuable two days, I think, where we are.

Given how close we are, we're behind the agenda, and how close we are to lunch, I don't think it's fair to ask NEI to start, only to quit in 15 minutes.

So I'm thinking that we just pause here and just have a little bit longer lunch, and be back at 2:00 o'clock Eastern to start with NEI.

MEMBER KIRCHNER: And, Dave?

CHAIR PETTI: Yes?

MEMBER KIRCHNER: Is there a need to ask for public comments?

CHAIR PETTI: Oh, yes, right. Gosh, we're doing it in pieces, yes.

Yes, if we have any public comments. So if member of the public has a comment, *62, unmute yourself and tell us who you are, and your comment.

Okay, not hearing any. I guess --

MR. WIDMAYER: Hey, Dave?

CHAIR PETTI: Yes?

MR. WIDMAYER: Yes, it's Derek. Can we get acknowledgment from the representatives from NEI and NIF that this is okay with them?

CHAIR PETTI: Yes.

MR. WIDMAYER: Because they're probably, yes.

CHAIR PETTI: Yes, Marc, are you out there?

MR. NICHOLS: That's right here, Derek, Chairman Petti. This is Marc Nichol, NEI. I think Cyril Draffin from U.S. NIC is on as well. We're going to tag team the presentation.

Yes, your plan to go for a break is great with us. We could start before 2:00 o'clock if you wanted to do that, but it's completely up to you.

CHAIR PETTI: Are we allowed to start earlier, Derek?

MEMBER BLEY: For subcommittees you can, I think.

MR. WIDMAYER: Yes, you're all right for, yes.

MR. DRAFFIN: This is Cyril Draffin. We have a reasonable amount of material, so a little earlier stat would probably be helpful --

(Simultaneous speaking.)

CHAIR PETTI: Okay, so --

MR. DRAFFIN: -- rather than stretch out the afternoon.

CHAIR PETTI: Okay, so let's just pause for one hour, and come back at 1:45 Eastern then. That'll work. Thank you everybody.

(Whereupon, the above-entitled matter went off the record at 12:45 p.m. and resumed at 1:45 p.m.)

CHAIR PETTI: Okay, I have 45 minutes after the hour so I guess we can reconvene. Marc, are you there?

MR. NICHOLS: I am, thank you, Chairman Petti, and thank you other Members of the ACRS Future Planning Subcommittee. I appreciate the opportunity to be able to speak with you all today.

I'm going to be joined by my colleague from the Nuclear Industry Council, Cyril Draffin, and there's a series, I'll go to it in the next slide. There's a set of topics we want to cover and we've divided them up.

These topics come out of a joint letter we sent to the NRC on November 5, 2021. We called it the comprehensive industry comments on Part 53, comprehensive because it now includes the full scope of the Part 53 rule that the NRC has issued.

But also comprehensive in that it provides

a lot more details than we've provided before. Almost all of the comments that we submitted are not new. They are perspectives that we've presented to the NRC, some of the topics for more than a year.

And so we'll discuss a lot of those. We're not covering every single item from that letter. In the interest of time, I've cut out some of the issues and tried to focus on some of the more important ones.

We do recognize that the NRC Staff has made some changes to Part 53, some of those changes based on comments that we've made.

But at the same time, we also recognize that some of our more significant comments, the topics we're going to present today, the NRC has not made changes to and has not provided us a reason why changes are not going to be made in these areas.

And so we do think it's important for you all to understand where we stand on those. So generally, our agenda, I think we plan on trying to end about the same time, so we'll try to be efficient in going about this.

MEMBER BLEY: Given your introduction, Marc, has the Staff told you that they're not going to incorporate these things, or they just haven't reached

that point yet?

MR. NICHOLS: For some of them they've told us that they're not going to incorporate our changes. For example, in relation to QHOs, they told us that's something we're just going to have to disagree about.

Some of the others were not as clear as to whether they planned to address those.

MEMBER BLEY: Thanks.

MR. NICHOLS: Let me begin with the topic of risk-informed licensing approaches. This involves the topic of QHOs, the role of the PRA, the specific PRA requirements. It also brings in design requirements.

It brings in the difference between Part 53 and Part 5X, as well as the TIRIMA that you all heard about yesterday. It tends to be one of the most important issues from the industry's perspective.

I'll explain why. It's obviously been a topic that you all have been discussing in great detail these past two days, and the Commission as well in their December 9th Commission briefing had a lot to discuss about this.

So I'll begin with what are the overall goals for risk-informed licensing approaches in Part

53? And there's two areas where we have goals, one is usefulness of Part 53 and the other is Part 53 that is risk-informed.

In terms of usefulness, we want a Part 53 where all licensing approaches are viable. The NRC has one vision of how to achieve that, we have a different vision, and I'll explain our vision and some of the details behind it.

MEMBER BLEY: Marc?

MR. NICHOLS: Yes?

MEMBER BLEY: Either for you or Cyril, if you can and if you can't that's okay but I'm interested, are you getting any indications of, and I guess there's a difference between designers and potential Applicants, I'm hinting at the Applicant side, which of them are likely to become members of EPRI, NEI, and already in the NIC?

I'll leave it with that because we don't have the other group here.

MR. NICHOLS: In terms of the industry companies, nearly all of the advanced reactor developers, these would be technology companies like NuScale, X-Energy, they're members of both NEI and U.S. NIC.

Of the utilities, they might be potential

owners, operators, almost them are members of NEI. I know that at least some of them are members of U.S. NIC, the utilities are also members of EPRI and some of the developers are members of EPRI.

MR. DRAFFIN: This is Cyril Draffin from the U.S. Nuclear Industry Council.

We've talked actively to developers and we did a survey in the middle of this year with 17 of the developers, which really represent all of the major people that have gotten the DOE awards to get their reactions to Part 53.

And basically, they think Part 53 is very important but they are not happy with where it is now, or at least where it was in the middle of the summer. And an important comment was that about a third of them like LMP and really wanted to pursue that.

And therefore, they like it risk-based and two-thirds did not.

So there is a difference, as was mentioned earlier today, in terms of developers, but in terms of what we're presenting today, it really represents cohesion from the developers on the major aspects that they pretty much all agree with.

MEMBER BLEY: Okay, so in your opinions, it sounds like you believe you are speaking for at

least the far majority of the industry here?

MR. NICHOLS: Correct.

MR. DRAFFIN: And there's bound to be people with some outliers as there is in most organizations, but yes, we have reviewed it, we have a Part 53 Work Group that everybody is welcome to be involved with.

And the last call was 15 people from different developers who were actively involved in commenting including in the group setting today.

MEMBER BLEY: Okay, thanks, that gives me a little perspective.

MR. NICHOLS: Absolutely, and everybody feel free to chime in when you have a question. So in terms of usefulness, all licensing approaches are valuable. It's less burdensome over the lifecycle of activities.

Guidance then will be important to explain how to meet the regulations because this implies that we're going to performance-based regulations, and so some guidance will be important there, especially as there may be differences in different types of approaches.

Within the risk-informed goal, first, we look at the NRC's PRA policy statement and we think

that it's still applicable to Part 53, that it doesn't need to be amended.

But specifically, there's a lot of in there to focus on but we want to reference here the use of PRA to the extent it is practical. And that gets to what I'll talk about in a little while on four examples of different licensing approaches.

The NRC's Part 53 currently has one way to use PRA. We'd like it to be more flexible and I'll talk about that.

Part 53 should allow for the variety of --

MEMBER BLEY: Since you brought that up, I believe you were here yesterday and you heard Marty Stutzke's presentation. They're beginning to look at PRA not as a monolithic thing but as something that can be adapted.

Is that reaching close to what you're thinking about or is it far away? I know you're going to give us details later.

MR. NICHOLS: So he talked about two different things.

He talked about the role of the PRA in the licensing basis and that's what we're focused on, and then he talked about a graded approach to the actual technical performance of the PRA itself, which I think

is where the NRC is focused on.

Now, Marty did talk about the TIRIMA, which is a licensing approach. I will touch on TIRIMA in a little bit, so rather than discuss it here I'll wait to touch on that.

They're complementary work. I would say it's not exactly the same things but they do complement each other.

MEMBER BLEY: And I assume you will be continuing to interact with the Staff. We just saw slides so as they develop a report to go with that, there will be continued interactions I'm sure.

MR. NICHOLS: That's correct. So with this various of roles and uses, generally there's been a lot of talk about leading and confirmatory roles. Marty yesterday talked about traditional and enhanced roles.

I think those are two sets of terms to mean the same thing, and so we think Part 53 should allow for both of those. The primary expectation, we do expect that Applicants will have a PRA.

I know that there's been a lot of discussion about, well, the industry is asking for deterministic and that gives the connotation that we don't want to do PRAs, and that's not what we've been

asking for.

We've been asking for more options for the role of PRA, I'll go into those details, but I just want to make sure that people are clear that industry expects to perform PRAs under Part 53.

We do recognize some cases, an alternative to a PRA may provide equivalent benefits, I'll cover that a little bit later. Generally, that might require some exemption if you could justify it.

We're not right now advocating that the rule has to allow for a non-PRA option. We do have concerns on the Part 53 rule language related to its ability to meet those goals for the licensing approaches.

So the NRC has stated that the performance-based design requirements, and I'll cover what those are, that's the safety criteria design features, they're not dependent on how a PRA is used.

We've had that view for a while and we've been trying to articulate that to the NRC. Finally, the NRC in an October 28th meeting made that statement, which was very good to hear that they had that recognition as well.

However, the NRC has still stated that only LMP and other methods that used PRA and a

licensing role can use Part 53.

They've also said that they don't know of any other methods that could do that so today LMP is the only known method that could use Part 53.

So a little bit of contradiction, if the use of performance-based design requirements is not dependent on the PRA, why can only one type of PRA use Part 53? I'll go into some thoughts on that.

The NRC has stated that the use of PRA in a leading role is required in Part 53 because QHOs are in the rule. I don't see why that has to be the case but nonetheless, we noticed that the NRC has not explained why QHOs must be in the rule.

I'll go into great evaluation on the pros and cons on putting the QHOS in the rule and where we've ended up in that question. And then finally, the NRC has stated that they're developing the Part 53 effects in response to industry's request to use other risk-informed approaches.

The NRC has actually said we've requested deterministic approaches and I think that's a misnomer for what Part 5X is. Part 5X is a risk-informed rule, it's not a deterministic rule.

However, we've never requested Part 5X. We've actually requested some straightforward changes

to Part 53 that would accomplish the same goal as what they're trying to do with Part 5X.

It's really two changes, one is to the QHOs, one is to the PRA requirement itself. I'll talk about how we see those as being possible and done, the details are in our November 5th comments.

And there may be some other confirmatory changes but there's primarily just two changes to address that.

So before I begin in talking about this, because the first question would be, well, if Part 53 is developed for the leading role, LMP, approach, and if you don't use that approach you could use Part 50, 52 or NRC's developing Part 5X, why isn't that okay?

And so it's important to know that despite all of our comments about the challenges in the viability of the Part 53 rule language, there is some really good benefits in the current Part 53 rule that the NRC has developed.

And so what we're trying to do is get access to the benefits for all of the risk-informed licensing approaches. I call it NRC is locked behind this paywall, all of these great benefits and the payment is to use LMP in a leading PRA role.

And so we want to say, look, NRC, you

don't need that paywall because you can do performance-based requirements that would allow all these risk-informed approaches to be used.

So what are these benefits? It's primarily in the performance-based design requirements. I mentioned this a minute ago.

The best benefit of this is that all of these requirements related to the design are all focused back to their relevance to the safety criteria. This is 53210 and 53220.

These performance-based design requirements, they're an integrated framework that the NRC has put together. I'm going to go to the next slide because the NRC has a graphic on this and you've seen it before but it has the radiological hazard in the middle.

It's got all these events that perturb the hazard and then it's got all of these design features, human actions, and programmatic controls that are utilized to help protect the public.

And while this says licensing modernization project on it in that yellow box, we think the other risk-informed approaches can achieve the same outcome as LMP with PRA used in different roles.

This is the good stuff of Part 53 we're trying to get access to. In terms of these performance-based acceptance criteria, I give some examples here of why we think they're well written as performance-based.

I will note the entire language is not performance-based. There's a few things that we made comments on in terms of specific wording that could be improved that's not the most important comment to make here at this time.

But in terms of the dose, 53210, it says the dose to the individual at the EAB exclusionary boundary will not exempt 25 rem TEDE.

So this is the driving goal, this provides a lot of clarity in terms of what protection of the public, acceptable protection of the public means, and then from here you have a hierarchy or maybe it's more like a Christmas tree.

These are ornaments of design requirements that connect back to that main dose criteria. That is in 53230, you have safety functions that are required and there are a few spelled out, that's okay.

But it also gives a lot of flexibility to the design to be able to identify the safety functions that apply to them. This is very important in terms

of achieving this technology-inclusive approach that is needed for Part 53.

In 53240, the licensing basis events must be identified, it gives some general requirements in terms of what aspects of LBEs must be addressed in terms of combinations of malfunctions, human errors, external hazards.

It gives the range of LBEs, but it doesn't specify the methodology or anything like that. So this would be an example of performance-based. 53400 it says design features must be provided to satisfy the criteria.

Again, it doesn't specify what these design features are, it's not saying you need an emergency core cooling system, it's not saying you need this system or that system, it's just saying that the application needs to provide them such that they satisfy the safety criteria.

And then finally, 53410, the FDC, the functional design criteria, must be defined and they must demonstrate compliance. Again, performance-based, they're not prescribed ahead of time, the Applicant figures out what they are, they present them to the NRC.

The NRC reviews that and makes an

independent assessment of whether they agree that design, in order to meet that safety criteria of 25 rem, has identified the right safety functions, events, design features, and design criteria.

So we think that you can do all of that in a variety of ways of using the PRA and that to do that is not dependent on one single way of using the PRA.

So we're going to talk more about that but this is why we think the good part, the benefits of Part 53 should be accessible to all risk-informed licensing approaches.

Moving on, risk-informed approaches desired by the industry, we've been asking for this for over a year. This has been one of the most important things.

We've been asking for part 53 requirements to be more inclusive and what we've found as the NRC's requirements related in these areas have been very detailed and prescriptive what's equivalent in Part 50 and 52.

And because we don't think it's necessary, we want them to just be on an equivalent basis to 50 and 52 in terms of the prescription and detail that's required here.

And so this would allow multiple

frameworks, actually, this would avoid the need for multiple frameworks, namely, Part 53 for LMP, Part 5X for everybody else, TIRIMA for people who don't want to use PRA.

So we think this would also reduce confusion, make it simpler to use in all of those things. So, finally, the NRC should be focusing on the criteria that demonstrates safety and not requiring specific methods for design and analysis.

I'm going to touch on this again in a slide coming up. So with all of this, we don't agree with the NRC that only LMP and other methods using PRA and a leading role should be the only ones to be able to use Part 53.

We think the other risk-informed approaches that we'll talk about in upcoming slides should also be able to use it. I'm going to get into two slides that talk about what is a risk-informed approach?

And this does line up with traditional enhanced that Marty talked about yesterday, the traditional being on top and the enhanced on the bottom.

And what it really is is in both approaches, whether you're doing LMP or TCAP or

whether you're doing an approach that had been used before and is being used today, they both are risk-informed.

They both have some deterministic elements and they both have some PRA elements. The traditional one is more predicated on the deterministic aspects of it and the LMPT cap with NRC is required in Part 53 is more predicated on the PRA.

And so the next slide will show in a better visual the spectrum of how a design and application might actually use a PRA in conjunction with deterministic. And so what we have is this speculate here.

The green is the amount of I'll say the safety basis that relies on deterministic approaches, the green is the amount of the safety basis that relies on the PRA, and you've got the left-hand side, which is primarily deterministic.

This might be your bounding analysis, your MCA approach, and then you've got on the right-hand side, primarily it's based on PRA. This would be part of what Part 53 is requiring, the LMP and TCAP approach.

Interestingly, the Part 5X that the NRC is developing, while it could be used by everybody, it

wouldn't incentivize the use of PRA beyond what is minimally required because you don't get much benefit out of the PRA beyond using it in a minimal place.

Now, as we overlay that, the NRC is proposing Part 53 that is on the right side in Part 5X on the left side, but in the middle is where the developers actually design and analyze their plants in terms of the role of the PRA.

And it's an interactive process and so the problem that the NRC is creating by saying Part 53 we're not going to change it, we're going to create 5X rather than making Part 53 more inclusive is that you've got this big missing middle, where the actual plants are designed.

And so, Joy, I think you mentioned a comment which is, well, design developers actually have a bunch of ways in which they want to develop this.

MEMBER BLEY: We lost him.

MEMBER BROWN: Is he gone?

MR. DRAFFIN: I think so but until he comes back, this is Cyril.

So I think it is important to recognize that when talking to our developers they really planned on having a speculate of the way they would

use PRA and deterministic.

And some people will use the LMP but not the full risk-based one, and so you find a spectrum of companies both based on design but also in terms of the balance between quantitative and bounding, but I think they tend to use both, the deterministic and the risk insights.

Let's see if Marc comes back.

MR. NICHOLS: Can everybody hear me?

MR. DRAFFIN: Now, we can.

MR. NICHOLS: My computer had a problem, I'm calling in by phone so bear with me one minute. Can you see slides or can somebody else share them?

MR. DRAFFIN: I'll see if I can share it.

MEMBER BLEY: And Marc, your volume is a lot lower than when you were online so if you can speak up a little that will help.

MR. NICHOLS: Is this a little bit better? I moved my microphone closer.

MEMBER BLEY: It is.

MR. DRAFFIN: Can people see Slide 10?

MEMBER BLEY: Yes, but if you go to full-screen mode it will be better.

MR. NICHOLS: And I don't know where I left off. Did I start talking about how the

developers actually design and analyze reactors?

MEMBER REMPE: You were talking to me, you mentioned my name and so it caught my attention.

MR. NICHOLS: Sorry about that, Joy. Joy, I was reflecting on your comment I think even earlier today, which is developers have a lot of options in terms of how they design and analyze a reactor.

And so now turning back to my words, what we would like the NRC to do is define the performance-based acceptance criteria for safety and not prescribe the methods of designing and analyzing a reactor in the regulations so that we have more flexibility to do it the way that makes sense for the different designs.

So that's the point of that slide. Let me move on to Slide 11.

MEMBER REMPE: Since you mentioned my name, yes, I have a question for you? What they were talking about today, that minimizes, perhaps, the regulator cost, which often industry complains about.

Where you leave it more widely open and less defined, you'll have a lot of cost because the path is not so easy to follow. And of course, I'm sensitive to people complaining about the cost of the regulator.

So have you considered that?

MR. NICHOLS: We did, and that's where I think the role of guidance comes in.

So Part 53 will at a minimum have guidance for LMP and TCAP, however, there's guidance already and actually, there's precedent and experience with using some of these other licensing approaches.

And so we think there's still clarity there, however, in addition to that, NEI is already beginning to work on guidance for Part 53 that would work for what we're proposing as an inclusive Part 53 that would provide guidance on how all of the whole spectrum of risk-informed approaches could meet the requirements to provide that clarity.

Moving on to Slide 11, NEI sent a paper to the NRC in September and it was technology-inclusive, performance-based and risk-informed approaches for assessing the safety adequacy of the design.

So in our conversations with the NRC when we kept asking for a Part 53 that allowed for more risk-informed approaches beyond just LMP and TCAP, the NRC said, well, we don't know what other approaches exist.

And so we set about putting together four

examples of different risk-informed licensing approaches and so that was the whole point of that, to show that multiple examples exist to described them in a way that you could start to figure out how to craft Part 53 requirements in a more inclusive manner.

And so if you go to Slide 12, the process we used for that paper is we basically started with the NRC's Part 53 requirements and so here, I don't list the requirement numbers here but here are about 6 areas where there is Part 53 requirements.

So there are the limits for protecting public health and safety, that's the safety criteria, safety functions, identifying LBEs, defense in-depth, design features, functional desire criteria and safety categorization.

And we said let's focus on those requirements and show how all of these risk-informed approaches can meet those requirements, although recognizing there were the QHOs and the prescriptive nature of the PRA were two of the limitations to being able to use more than LMP under Part 53.

So that would be something we'd have to just consider. And so if you go onto Slide 13 --

CHAIR PETTI: So, Marc, just to make sure, these are your common denominator of philosophical

safety criteria that one needs to consider, right?

So all the stuff you're going to talk about, all these different options all have these key features. They may be different in how they are addressed but they're all there?

MR. NICHOLS: That's right, absolutely, that's exactly right. And we put it in the Part 53 framework but we also based it in the underlying principles of LMP.

So LMP itself had, these are the fundamental things that LMP is going to achieve from a safety case perspective.

And we addressed all of those but we just put it into the Part 53 framework since that's our focus.

Slide 13 takes those fundamental elements and it talks about how do we frame these in terms of principles? They're not exactly criteria in terms of being able to decide, yes, you've met this criteria, but they're the things that must be provided.

And so they do have some characteristics of criteria. I'll read these just for completeness. The plant has to meet the established limits for adequate protection of the public health and safety.

Number two, the safety functions, design

features and functional design criteria relied upon to meet the safety criteria are established. We put all those together because that frames what I call the performance-based requirements around the design.

I should mention it here. We use the term functional design criteria. In Part 53 it's the equivalent as a principle design criteria, if you look at it how it's defined and used.

So we're using Part 53 terminology but the functional design criteria is essentially the principal design criteria that we're familiar with.

Number 3, the systematic selection of LBEs adequately cover the range of hazards that a specific design is exposed to. We've really embraced the ACRS's conversation that the identification of initiating events has to be systematic, it has to be rigorous.

Marty's presentation yesterday in terms of what rigorous and systematic means are things that resonate with us, and so we want to make sure that everybody is aware there is a systematic and rigorous selection of LBEs in all of these risk-informed approaches.

Now, some use PRA to a very late extent to do that, some use PRA much less to do that. And as

Marty said yesterday, you can be risk-informed without actually quantifying things.

So that is one of the distinguishing factors between the four examples we'll get into in a minute. Then the SCCs are categorized according to their safety significance.

The design reflects the application of an appropriate philosophy of defense in-depth. Defense in-depth actually happens to be something that each of the examples handles in different ways, but we think are all appropriate to the methodology and designs they can be applied to.

Special treatment for SCCs as well as associated programmatic controls in human actions provide reasonable assurance that the SCCs will perform the safety functions for which they're relied upon in the design.

And then finally, the scope and level of detail for the design and analysis of the plant and the licensing basis information adequately describes the safety case.

Now, we didn't address that in our paper, that's Item 7, it's really the topic of TCAP and so they we said to ourselves the NRC can formulate Part 53 based on LMP, this really gets to it's not what

work needs to be done, it's just what work needs to be documented in what fashion to submit to the NRC.

That wasn't an urgent need so we can address that at a later time.

So moving on to Slide 14, these are the four examples we evaluated.

Example A was LMP, the licensing modernization project, NEI 1804 and it has been mentioned and I will say there are many an industry that want to use LMP and TCAP the way they're being developed.

NEI is very supportive of those documents because obviously, there are guidance documents. We never intended them to be required for use for all advanced reactors and we never intended it to be the sole basis for Part 53.

And so that's why it's important for us to preserve the ability to use other risk-informed approaches. There are others in industry that down to use LMP and TCAP for whatever reason.

They see that they can develop the safety case and demonstrate safety much more efficiently with other design and analysis methods and part of that may just be particular to their design, part of it may be particular to just how they're used to doing work.

But that's why it's important for all of these options to be available.

So Example B is actually using LMP but the PRA is in a complementary role and so you do all of the same analysis but when it comes to providing the documentation, where are you hanging your hat on the safety basis?

The PRA is no longer a leading role, it's a complementary role in that. The NRC has approved a topical report for Kairos Power for Example B where 1804 is used with PRA in a complementary role.

Example C is an approach compatible with EA safety standards. This is a point of confusion. The NRC has said that Part 5X in large part is so that people can use the IAEA approach and that we've asked for that.

I think it was a miscommunication. What we were trying to say is that we want a licensing approach or a safety basis that's compatible.

Compatible means that when we take our design outside the United States to places where they're going to impose the IAEA safety standards, there's minimal changes to the design and analysis and safety basis of that.

And so we described how you can utilize

some IAEA safety standard concepts in an NRC regulatory framework. Example D is a bounding analysis, some people call it a maximum credible analysis or accident or maximum hypothetical accident, that's the concept here.

Oklo has used that type of approach in their application that's in front of the NRC right now. So the conclusions from that white paper is that all utilized PRA, some use it a little, some use it a lot.

All of those approaches that use the PRA are able to demonstrate safety, especially that safety criteria which is the most important but also those principles that, David, you and I just talked about on a previous slide.

They can all meet Part 53 design requirements and even less prescriptive versions of the PRA requirements and we'll talk about the changes to the requirements that we think are necessary.

They can all utilize the frequency consequence curve, that's one of the things that's coming out of LMP. In fact, in the examples, all of them do utilize or we explain they would utilize the frequency consequence curve.

The bounding analysis has the option to

not use the frequency consequence curve when it's appropriate to do so. And what we found is specific uses of those really relate to how the designer wishes to approach the design and analysis of the plant.

So that's why it's important to have this flexibility. I'll move onto Slide 15 and this gets into the safety criteria and the QHOs. And in my opinion, there's been little discussion of whether the QHOs are appropriate in policy or in the rule.

And I think that's the most important question to ask and that's what we've been trying to discuss with the NRC since January and have not had much success in that.

So one of the things the NRC has said is the QHOs must be in the rule and even in the December 9th Commission briefing the NRC was saying if the QHOs aren't in the rule then what should be in the rule?

And in my opinion, I think this is really the wrong way to frame the considerations of where to put QHOs and how to address beyond-design-basis events.

The right framing, I should start out by saying, is why should the QHOs be in the rule at all?

And the reason I'm saying that's the right framing, that's the question we should be asking, is

because the QHOs have been in the policy statement for decades and we've not had any issues with that.

And the new plants that are being licensed under 50 and 52, they'll meet how to QHOs as a policy statement matter and the NRC yesterday said the QHOs were in guidance. That's not quite correct.

If QHOs are in the policy statement, that's a higher level more impactful place for them to be. And so we've not had any issues under License 50 and 52. You're meeting the QHOs, there's not much issue there.

And then the second part is the QHOs are in the rule, my understanding is, to address beyond design basis events. And so the question would be, in the past and today, the beyond design basis events are addressed by mitigation requirements.

This is the recent 50.155 mitigation and beyond design basis event rule.

And so I'll in fact come back to that rule in several places because it's relatively new and the NRC Commission has weighed in on a lot of the things that the NRC is trying to put in Part 53 related to beyond design basis events and PRQ requirements and said, no, those shouldn't be in the rule.

The question we should be asking, why

should the QHOs be in the rule? I think there's three things to ask.

Is there a problem that we're solving by putting the QHOs in the rule? I don't see any problem being solved, as I just mentioned.

Are there benefits to putting QHOs in the rule? Certainly, there are, the next slide goes through the advantages and disadvantages so I'll hold off on that.

And the last question is are there disadvantages and risks? And again, there are, of putting the QHOs in the rule.

If so, are those disadvantages and the risks reasonable, are they being mitigated and are they far outweighed by the benefits of having QHOs in the rule?

This is the discussion I think we should be having, this is the discussion we tried to have at the NRC in our January meeting and we were not successful in getting the NRC to engage with us in that conversation.

Like I said, they've not provided a basis on why the QHOs should be in the rule. So on Slide 16, this is our evaluation of the advantages and disadvantages of putting the QHOs in the rule.

We provided this to the NRC back in January in a public meeting and we submitted it to them in which in our February 11th comment. And so there are some advantages and there are some disadvantages.

So the first advantage, it enhances regulatory stability by making it harder for the NRC to change the limits, the QHOs specifically, or make arbitrary judgments related to that.

So there is a stability benefit there, however, including the QHOs in the rule also increases regulatory uncertainty. The reason is because they're establishing requirements without specifying the consequence limits.

The phrasing of it, if I can get it right, is something like 5e to the minus 6 probability. I'd say the risk is less than 5e to the minus 6 for prompt fatalities, and then we have I think 1e to the minus 7 for latent cancers.

That's an overall risk number and certainly we could figure out probabilities and frequencies because there are cut-off frequencies for beyond design basis events.

So we can figure out events that we're considering under there but the question is what are

the dose limits that lead to those consequences? And when I've asked the experts on where are they?

They're not in the rules, they're not in guidance, they're not in any standard, what I find is that those consequence limits are in the computer code of MAACS itself, the severe accident consequence codes.

And so I asked can you show me a table of all those consequence limits that the code is using so at least we can point to that?

Well, we don't really have it and so now you're looking at this and saying, okay, you're going to meet a regulatory requirement without knowing what those dose consequences are.

And you're going to have to point to a computer code, and those consequence limits that give you that answer are very deep inside of that and you have no paper documentation to reference it.

MEMBER BLEY: Marc, let me interrupt you for just a second.

I don't want an answer now but the Staff, as you listen to this, when these guys are done with their presentations, I'd be interested in hearing from you about this last point that was pointed out by Marc.

MR. NICHOLS: Thank you, I'll keep going.

MEMBER REMPE: Sorry to interrupt you, why wouldn't you just use the PAGs because the advanced design developers don't want to have emergency planning.

So why wouldn't they just say, yes, the QHOs are for me for fatalities but it seems like the PAGs would be a more limiting thing?

MR. NICHOLS: Yes, the PAGs would be more limiting and you could do that, that would be 1 rem and so 1 rem for a beyond design basis event is going to be very limiting.

If you look at the LMP frequency consequence curve for some of the beyond design events, you can get allowable doses up to 200 to 700 rem. So that would be a huge, I'd say, penalty to take.

MEMBER REMPE: Especially if you do the curve once per year, which is what was propose yesterday for avoiding the PRA. Because I would think the frequency would be difficult without a PRA.

And you had said in your comment about, well, we can get the frequencies of the advances? If you don't have a PRA I don't even know how you get the frequency.

MR. NICHOLS: That's why the NRC has said that the PRA requirements in Part 53 are the way they are, because the QHOs are in the rule. I make that in a later slide but you're exactly right.

If you have the QHOs in the rule, then there's no way around having a full PRA that is the basis for regulatory legal compliance. And I actually have a slide that talks about the complications of that.

(Simultaneous speaking.)

MEMBER DIMITRIJEVIC: Marc, I have a question for you here because I think your advantage and disadvantage are totally contradicting each other.

How can you have regulatory stability based on that latent and the immediate fatalities if you don't know the dose?

There is no stability there, you can change those rules. What you're saying for disadvantages is totally right in my opinion, it increases uncertainty so, therefore, you cannot have advantage to that.

(Simultaneous speaking.)

I understand what you mean.

MR. NICHOLS: No, I exactly understand what you mean and you're correct. What you're

pointing out is the complexity of this issue, of putting the QHOs in the rule.

This frustrates me a little bit when the NRC tells us we've already decided QHOs are in the rule, this is non-negotiable, we're just going to disagree on this. And we've presented this information to them.

It's a very complex issue, it's not so simple as saying, yes, the QHOS are in the rule, we're good to go. You can see this, there are advantages where there's some stability, clarity, but then there's disadvantages that reduce stability and clarity.

And so it's not a very simple decision.

MEMBER DIMITRIJEVIC: What is in your opinion stability implied? That's what I fail to see. What is the stability quality with QHOs?

MR. NICHOLS: The stability would be that the QHOs would not change. The number 5e to the minus 7 and 1e to the minus 6 would not change. That's what I meant by stability.

MEMBER DIMITRIJEVIC: Yes, but those are related to -- these are related to something which we don't know. It's for that latent example, the cancer, or to the risk presented to the latent cancer, which

we don't know what that is.

So of course it's complex but we are sort of staying on this level that we actually don't know facts. So we are basing this on something we totally don't really understand and we don't know the facts.

That cannot be stability so that's a point which I really feel very strongly about. So we can just really pretend to keep our eyes closed and say the adjusted risk has always been there and we understand what that means, but we actually do not.

We do not know the days, the essential days for example, and until we can specify those, which we will never be able to do, we cannot really know the base.

MR. NICHOLS: Thank you, I appreciate that. I'll keep going here unless, Vesna, you had a question. It didn't sound like a question.

MEMBER DIMITRIJEVIC: No, it was just a comment, it wasn't a question. The question was how can you claim that there is advantages because the disadvantage actually totally negates the advantage?

MR. NICHOLS: We tried to be objective here and show advantages and disadvantages in this slide, and in the next slide I'll show you we came down in our position on this.

So there's some other things, I'll just do the advantages and come back to disadvantages rather than back and forth. So there are specific limits, quantitative limits in the regulations.

That had some advantages to it. The risk levels in the regulations are now exactly the QHOs from policy statement so there's some consistency there.

QHOs by nature of being quantified are a little more understandable to the public, even if the understanding of how you get there is much more complex. And the QHOs really do define the maximum acceptable consequences.

And they can avoid more conservative surrogate requirements. So, for example, CDF and LERF are more conservative surrogates.

They have the potential to eliminate the need for some other requirement, so if you had the QHOs in the rule you wouldn't need to have a requirement to mitigate beyond design basis events.

I'll note the NRC still includes a requirement to mitigate beyond design basis events so that advantage is not achieved by the NRC's proposal.

More on the disadvantage side is that these consequence limits are not regulatory limits

instead of policy goals. And so I think this reduced stability is what you just mentioned, Vesna, so it's two sides of the same coin.

It is also counter to the Commission's intention that the QHO is our goal and not limits themselves. I'll talk a little bit more about the PRA policy statement in that.

And so this would be a completely different approach and it's not to say the NRC can't take a different approach to Part 53, but I think we should all acknowledge that and that should be a conscious decision.

Not having consequence limits that I just mentioned before and the complexity of demonstrating the QHOs, which I think was your comment, Vesna, increases the licensing risk in terms of knowing what would be acceptable.

If there are any changes to societal risks because these are all related back to societal risks, that could change the requirements and that could force changes in the facility design because these are now regulatory requirements rather than applied through the policy statement.

The analyses and calculations related to demonstrating the QHOs are met are now used for legal

compliance. I have another slide on this but this is a big deal.

Right now, meeting the QHOs and using your PRA, this is used in, I'll just say, a complementary manner but it's not the primary decision for safety. It's supporting the decision, it's one of many things.

The primary decision of safety is based on other things, not meeting the QHO. If QHO is the primary decision for safety, the analysis you just used legal compliance with the requirements now have a different role.

And I'll just address that later. There is a risk that QHOs would need to be revised. The NRC discontinued its efforts to revise the QHOs the year 2000 and to update those safety goals.

The reasons given at that time was because they needed to have more experience with significance in incorporating experience with risk-informed decision-making.

And so there is a question on whether the QHOs would need to be -- the Commission would decide that the QHOs need to be updated if they're going to be included in the regulations.

I'll move on to Slide 17 to continue our conversation on QHOs. So in our opinion, the QHOs in

the rule did not improve safety but they do create complications.

This is where we've come down on the advantages and disadvantages. This is the large majority of the our members.

I will mention there's at least one of our members that think the advantages of QHOs outweigh the disadvantages, but as an official NEI position it is to keep QHOs in the policy statement and not include them in the rule.

Because the safety is the same, whether the QHOs are in the rule or whether QHOs are in the policy statement, the safety is exactly the same. In both approaches or both locations, you have to demonstrate the QHOs are met.

I talked about currently you do that, I'll call it off on the side under what Part 53 is proposing. If you do it front and center, it is part of your compliance. The application's design and analysis are exactly the same.

We've already said that industry is saying we're going to use PRAs in this and we do want to meet the QHOs and demonstrate they're met.

The NRC's scope of review is exactly the same, whether the QHOs are in the rule language or

policy statement, the NRC is still going to verify those QHOs are met.

So that's why we say the safety is exactly the same. The difference is in this legal compliance and this is really important stuff.

So if the QHO is in the policy statement, like I said, the Staff confirms the Applicant's conclusion, the QHOs are met, this is done.

I'll say it's off to the side, but it's still done as part of the application process and review. It's just one part and not the primary part of the safety determination.

Well, if the QHOs are in the rule, it takes a different effect. So now the Applicant must demonstrate legal compliance with that regulation.

Well, if I have to demonstrate legal compliance with QHOs and my PRA is the only way to demonstrate legal compliance with that, everything that's in that analysis and supporting justification for meeting the QHOs is now subject to hearing contention.

There was a question earlier today about whether the PRA needs to be submitted to the NRC and I'm not going to provide my own thoughts on whether that should or shouldn't be but it would be much more

difficult to argue the PRA should not be submitted for NRC review and on that docket if the QHOs are in the rule, especially if an intervener wanted to challenge that PRA.

If they do wish to challenge that PRA, they're not just challenging the methodology, they're challenging every assumption and input to that PRA. And so they can say, well, we disagree that your assumption for failure of this component is accurate.

And now you're going to have that as a hearing contention. Whether it gets accepted or not is a different question.

Or they could come back and say, well, we don't think you have enough testing and validation to justify this type of thing or you haven't considered this or that in your PRA.

And so what we worry about is that with that, you've now taken something that is not improving safety by having the QHOs in the rule and you're now creating a lot of licensing risk.

That was the basis for one of my points earlier. So the NRC has stated that the QHOs in the rule requires a leading PRA approach. That's another problem because we want to use multiple licensing approaches in Part 53.

I would say the leading PRA approach, while we do support it as one option, it's never been used in a licensing application and approved by the NRC or any regulator.

And so some of those other examples we asked for earlier have precedent and they have been used to license advanced reactors before.

And so what the NRC is creating is a Part 53 that is based solely on a licensing approach that has never been I'll just say run-tested through a regulatory approval of an application.

And it is precluding all of these other licensing approaches that have been proven to demonstrate safety. And so that just seems to not be the most prudent course of action.

And the QHOs in the rule, the NRC has said it's just an evolution of the PRA policy statement but we don't believe so. We believe including the QHOs in the rule far exceeds the envisioned application of them.

So I'll refer back to the SECY 89102 for that. And that says that while the QHOs really are just to evaluate the adequacy of requirements to achieve acceptable risk to the public.

These are the requirements themselves.

This isn't even evaluating the adequacy of the design, this is adequacy of the requirements. So is this design requirement adequate?

Do we need another design requirement, that sort of thing? The QHOs were intended to be objective, not to be used as requirements.

That specifically said in that policy statement, that's why we think that if QHOs are in the rule it needs to be explicitly and thoughtfully decided because it's not consistent with that previous decision.

But it would be useful as a basis for guidance. Now, it would also be useful in a generic sense in making regulatory decisions for an Applicant.

If you go into that, the generic sense means it's not the primary basis for making that regulatory decision, it's just one piece of it. And that's the confirmatory role of that.

This is why we think the QHOs and the rule don't make sense.

Next slide, 18, if there's no questions on that. Slide 18, what do we think should be done for the QHOs in Part 53 to achieve this acceptable risk to the public?

Well, we think that Part 53 should follow

the safety goal policy statement and apply QHOs as a policy and not as requirements.

We do think the NRC should ensure Part 53 requirements, achieve acceptable risk to the public and we think that they have done that in the other requirements they've created.

So the dose to the public for normal operations is 1 rem, occupational exposures is less than 5 rem, AOOs, if the NRC want --

So the thing the QHOs do is they create something for things that are not design basis accidents or normal operations. So that's AOOs and beyond design basis events, it puts a little category box for safety criteria there.

So we think they can do two things. One is they can put mitigation for beyond design basis events, similar to 50.155, and I have a discussion later this afternoon in beyond design basis on how to do that.

The other is AOOs, we don't think Part 53 needs an AOO requirement, Part 50 and 52 don't, but if the NRC thought it was necessary you could create a requirement and set the limit at 1 rem.

Design basis accidents of course have their 25 rem and we think that part of this is really

important to establish the requirement for systematic search of events.

The QHOs would inform the basis for guidance to establish risk metrics so QHOs would be used directly for comparison as an LMP or for other methods. You could use QHOs to develop surrogates with core damage frequency.

I'll move on to Slide 19. So that's Item 1 and the two requirements that need to change in order to allow all those risk-informed approaches, keeping QHOs in the policy statement is Item 1.

Item 2 is making the PRA requirements performance-based. Right now, they're very prescriptive. This is looking at Part 52 requirements, it has a high-level requirement of Applicant providing a description of plant-specific PRA.

For time reasons I'm not going to go through the details of this slide, I think everybody is familiar with how the practical uses of PRA and 52, not the required uses.

So let's go to Slide 20.

This is the Part 53 PRA requirement and so the gray is in the Part 53 requirement that is equivalent to the Part 52 requirement, red is in the

Part 53 requirement that has no equivalent over in Part 50 and 52.

So in Part 53, consider events to the challenge plant control and safety. We agree with that, conform with generally accepted methods. We're okay with that.

Be maintained and upgraded, however, every two years is what Part 53 says. We think it should be every four years consistent with Part 50 and 52. The other things the NRC prescribes in here, let me put that in --

MEMBER BLEY: Excuse me? Don't the existing rules require every four years but sooner if there's a major change to the plant?

MR. NICHOLS: It could be, the detail escapes me at the moment, yes.

MEMBER BLEY: To me, that's the important thing. If you change the plan around you ought to really bring it up to that.

MR. NICHOLS: We would be fine with the provision that's in 50 and 52. I want to address two areas of where the NRC is including more prescriptive uses of PRA and Part 53 beyond what is required for 50 and 52.

I'll refer back just for reference to

Marty Stutzke's slide yesterday, I think it was Slides 32 and 33. Slide 32, he said one area where the NRC is increasing PRA requirements in Part 53 is that we're including the practical uses of PRA, the slide I just showed.

Which, one, is for severe accidents, we're using PRA for severe accident policy statement, boom, all right, we're going to include that in the rule. The other is for I think it was the safety goal policy statement.

You need PRA to be able to do that, primarily for the QHOs that I just mentioned. So we're going to plop that as a requirement in the Part 53.

So on the surface, that sounds logical, it's in the safety goal policy, we're writing a new rule, I guess we probably just forgot to do that and we should include it in the regulations.

But I don't see it that way. If you go back the timeline and Marty's Slide 17 -- and I think Marty did a great job on his presentation and I really appreciate how he simplified a lot of this stuff in his slides.

If you go back to Slide 17 it shows a history and if you look closely at the history, safety

goal policy was established 1986 the severe accident policy statement 1985 already established the need for the PRA to be able to do that.

Part 52 came in in 1989 and then finalized in 2007. They had an opportunity to require t PRA to be used to meet those policy goal statements but it didn't, as you know from Part 52, include those requirements.

The question is why?

I haven't had a chance to go back to the same statements of consideration for that rule, that would give us the most clarity on whether it was a conscious decision, they actually evaluated it and decided, no, those are policy statements, we're not going to include those as requirements.

In fact, I'll come later and I'll talk about severe accidents, and the Miti BeDe rule, the NRC Commission provided direction back to the Staff that severe accidents should not be requirements.

They should continue to be handled the question they are today.

And so that gives a clear indication to me that, yes, it was probably for a reason that the required uses of PRA to meet those policy goal statements was not included in Part 52.

Again, we have to read the statements of consideration to know exactly. The second area on this Slide 33, he said we're going to include all these other requirements for use of PRA and these also establish the PRA must be used in a leading role.

These are all the ways it's used in LMP, and that's fine for LMP, that's how they want to use it, but the other risk-informed approaches would not use PRA in this manner.

And so this is what excludes those other risk-informed approaches from using Part 53 and the question is why do you need those in there? The NRC has said we need those in there because the QHOs are in the rule.

I just made the argument on why the QHOs shouldn't be in the rule, so if the QHOs aren't in the rule based on the NRC logic, all of these can be removed. Now, even if the QHOs were in the rule, I still don't think all of these requirements need to be prescribed.

This is really getting into locking in a single way of designing and analyzing a plant, which works for some but doesn't work for others. There are areas that we think would be problematic.

MEMBER BIER: Excuse me, can we stay there

for a second? Coming from a PRA perspective myself, this is Vicki Bier, many of the things at least that show as red on that list sound like things that I would think would be just good practice for achieving safety.

So can you give me one or two examples of things that you think may not be necessary to do under certain design philosophies or safety philosophies, and why not?

MR. NICHOLS: I would agree with you, all of these things need to be done and if you go back to my slide on the September white paper, all of these things are done for each of the methods.

The difference is that the PRA is not used in a leading role for all of these, the PRA would still do many things but it would be used more in confirmed the decisions that you would have done all of these things with a deterministic method or some combination of deterministic and PRA.

MEMBER BIER: So, for example, you need some method for determining licensing basis events but that might be an input to your PRA, not an output from your PRA? Is that what you're saying?

MR. NICHOLS: Exactly. Or a perfect example is -- no, I think you've got it, the other one

just escaped me, sorry.

MEMBER DIMITRIJEVIC: A perfect example of what the classification of ISCs, that's a good example of that PRA being supported because you always start with the deterministic safety, whether there's no safety, and then you have the risk-important or not risk-important.

MR. NICHOLS: Absolutely, thank you.

So we'll go to Slide 21 next. What did we propose for the Part 53 requirement? We do propose that Part 53 needs a requirement.

We actually even proposed more verbiage in Part 53 for the PRA requirement than what's in Part 52.

So we're not opposed to PRA requirements, we're opposed to PRA requirements that only allow one way to analyze a plant. And so we're proposing a performance-based analysis requirement.

And so in analyzing the LBEs and systematically identifying event sequences with demonstrating the safety criteria that you can do these with a mixture of deterministic and PRA.

You can certainly do it leading PRA, like the NRC is requiring, or as those other three examples that I mentioned, you might use the deterministic

methods and then confirm them with your PRA, the traditional way that Marty talked about yesterday.

And what role or scope does that leave in the PRA requirement itself? The PRA requirement would say you must perform a PRA and you must incorporate the risk insights from that PRA into the design.

We believe that is important. We would say the requirement should say the PRA completeness should be commensurate with the completeness of the design.

This gets to Marty's slide that says, well, at the construction permit stage you might have less completion of your PRA. By the time you get to operations, you'd have more completeness of your PRA.

And again, it must be maintained and upgraded every four years, so we think that provides the level of confidence that risk insights from the PRA are going to be utilized in the safety case in a way that avoids all of the complications that we just mentioned before.

Now, if people want to do more PRA, that's perfectly fine but the complications here primarily being not allowing other risk-informed approaches.

And we think these performance-based requirements achieve the exact same outcome as the NRC

prescriptive requirements in terms of rigor and confidence and ultimately, the level of safety and the design, they're inclusive to combine all roles of the PRA.

And one of the important things is we really believe the NRC's rule they've put out on Part 53, even the QHOs and the PRA requirements we just talked about as well as other things we're going to talk about, it will achieve safety.

There's no question in our minds it will achieve safety.

The question that industry is looking at is, yes, we can achieve safety and we can get there through multiple different pathways and we want a Part 53 that allows people to pick the most efficient pathway for their design.

So that's where we're coming from. Let me go to Slide 22 and some discussion about the NRC's prescriptive requirements for PRAs.

I've talked about our concern with QHOs in the rule and the more prescriptive requirements might lead the NRC to required more of the PRA to be submitted in the licensing basis.

So the NRC has heard those concerns at the December 9th Commission briefing. The NRC Staff told

the Commissioners that is not their intent, to require the PRA to be submitted to the NRC and reviewed by the NRC.

So we support this intention.

We don't think the NRC should be part of the licensing basis. We think it should be available for the NRC inspection just like it is today, however, we see in the rule language that's not the outcome, the intention has not been achieved by the rule language.

So if you look at 531185, it has a requirement that states and I've paraphrased it here to fit on the slide, the safety analysis report must include an analysis of LBEs to determine compliance with 53220 and it must address all of the elements in 43450E and F.

Well 53220 at the QHOs, 53450E and F is the PRA requirement, and both of those that I just talked about were problematic. And it says you must include the analysis that determines compliance.

And so the only analysis I know of that determines compliance with those things is your PRA. And so this requirement, whether the NRC intended it or not, does require the PRA to be submitted as part of the licensing basis, in fact as part of the SAR.

In the May 27th meeting, we were talking about the NRC and we talked about these risk-informed approaches. The NRC had made a comment suggesting that the PRA would need to be submitted to the NRC for review as part of the LMP method.

I know that's been a question the ACRS has asked the NRC today and yesterday. I am still not sure what the NRC's position is on that. I think I heard them say no, it doesn't, and then I think I heard them say, yes, is it.

So I'm not really clear on where they stand on that but I do understand the intention they made to the Commission on December 9th.

I would also note that in the NRC's endorsement of TCAP, that methodology licensing basis must include more PRA details in the SAR than is currently required by the NRC. That is specifically the reliability and capability targets.

Now, it's incorporated by reference so it's not actual pages in the SAR but incorporated by reference brings with it the same regulatory controls as if it was in the SAR directly.

And mainly, that means that if you have to or need to make any changes to those reliability and capability targets, you have to go through the 5059

process to determine whether you need prior NRC regulatory approval.

And if you do, you need to submit a license amendment request. And so those three things are evidence that the intention that the NRC has in relation to the PRA being submitted is not being achieved by the rule.

Next slide, please, 23. So this slide gets to -- this is my last slide in all of this risk-informed licensing basis -- what is the path forward from here? How do we move forward?

I mentioned before the NRC 's path forward to solve this issue is very different to what we think the NRC should be doing and specifically, the NRC has proposed to leave Part 53 as it is.

And they've said Part 53 is only available for LMP and they've said Part 5X is available for everybody else. And they're maybe this TIRIMA approach that would be developed if people don't want to use any PRA at all.

So I think that approach is inefficient, I actually think it increases confusion and the industry's proposal for a single inclusive framework of Part 53 would be much preferable.

And so what's the difference between that

approach? I just talked about Part 53 and the 2 or 3 frameworks and how they're divided up and you have to pick different ones, and how Part 53 with LMP is the only one that is able to utilize the benefits of the performance-based design requirements.

Part 5X doesn't allow that. I think I remember an earlier ACRS conversation on Part 5X and there was a comment that, wow, this just seems almost impossible, significant effort, complex, and we would agree with that.

The industry is saying, well, there's only two real changes that need to be made, one is put the QHOs in the policy statement, achieve the same safety and avoid all the complications, and the second is to remove the prescriptive details in the PRA requirement that we don't think is needed, is not there in 50 and 52.

And then you allow all these risk-informed approaches under a single inclusive framework. I think that is a lot easier to do. There are confirmatory changes to other requirements.

So for example, I referenced that one for the SAR, you would not need a requirement to submit a PRA in that SAR. There's a couple of others where you just have to make conforming changes.

So with that, I think that if the NRC were to adopt this idea of a single inclusive Part 5, they could do that with much less effort and much less time and so that's what we're recommending, they should do that and abandon Part 5X to support that.

Because we understand the NRC does not agree with our proposal but nonetheless, we think that's the best path forward.

So industry has already started to develop guidance that would show how multiple risk-informed approaches could meet this single inclusive Part 53, one that doesn't have QHOs and one that has a less prescriptive PRA requirement.

And we intend to share the first draft of that guidance with the NRC next year. I don't know if it will be March or May but certainly, that's the timeframe we're looking at providing that guidance document to the NRC.

I know there was a question earlier about are we working with the NRC on the guidance that Marty Stutzke has talked about. We probably should have a conversation with the NRC because there is some overlap in scope there.

So we'd like to benefit or synergize the two efforts so that each benefit from each other.

That's everything for risk-informed licensing approaches. Are there any questions?

CHAIR PETTI: So, Marc, just a question, is this the last time we're going to talk about the QHOs?

MR. NICHOLS: There's one more slide on QHOs related to how they are the reason that the beyond design basis events are being included in the design basis.

CHAIR PETTI: I was just wondering if we ought to let the Staff respond to Dennis' claim now or wait until the end of the whole presentation while this is all fresh in the Members' minds.

(Simultaneous speaking.)

MEMBER BLEY: Dave, if we do it now, I'd further ask the Staff because I hadn't thought about this idea that it was not really intended to be used in licensing.

But the arguments that led to those words in the original safety goal memorandum, and Dave Okrent was the guy who really developed that for ACRS. The situation that existed back in the 1970s and 1980s is a lot different than it is now.

But if that's in fact so and if in fact the Staff's going to continue with the QHOs in the

rule, it would seem they would need to or ought to take a policy issue to the Commission.

I'd be interested in their thoughts about that as well. Let's see if they want to address anything that was brought up earlier.

MR. RECKLEY: Dave, Dennis, this is Bill Reckley. The nature of the rulemaking is it includes policy issues that will be taken to the Commission.

MEMBER BLEY: Touche.

MR. RECKLEY: So that is in and of itself taken care of.

As you mentioned, the reason in the 1980s that the policy statement said what I said, there were various reasons for not imposing it at the time, including what the risk profiles were for individual plants and whether it would be used for backfitting and so forth.

We've moved on since then, operating plants have been able to show without much difficulty for the most part that the QHOs can be satisfied. The reason we have included it in the iterations of the preliminary text that we've released thus far is to provide a performance metric.

And the importance of this, it gets kind of convoluted in the discussions, however, we need in

the end to have rules that are specific enough that in the totality of the rules, we are confident they provide the reasonable assurance of adequate protection finding that we need to make.

And in our first iteration, we had proposed to revisit actually coming close to defining that. And for various reasons and interactions, we moved away from that and back to the position that adequate protection is in the Atomic Energy Act.

It's enabling legislation for us to do this and other rulemakings, as is Section 161 on minimizing danger to life and property.

But as opposed to defining those numerically, which was always a challenge, we'd move back and we'd describe this in the second and third iterations of the text, that they were important but not to be defined.

So you need metrics and so what you have in the existing framework is largely what was derived in the 1970s and then supplemented over the years through the GDC and then other requirements, and I'll say for both de-prevention and mitigation of beyond design basis events.

And that total work over the years and the experience enables us to make that finding.

So when you move over and say you're going to use a probabilistic, more risk-informed approach, more systematic review starting from scratch as opposed to based on the Light Water Reactor construct, you need performance goals.

And so as we said from the very beginning of this, there have been a lot of work over the years in developing the LMP methodology and it seemed to provide that framework that we could build on.

So that includes looking at individual events and it also importantly looks at cumulative risk measures the most prominent of those, which are the QHOs. So that is the rationale.

MEMBER BLEY: Let me sneak in two things here.

The first one, if the Commission votes yes under the role, that's a de facto policy issue clarification but I'm remembering that 15, 20 years ago when there was a proposed rulemaking associated with the then-technology-neutral framework.

And they thought they had a place to apply it, there were six or seven policy issues that were taken to the Commission early on before they took the whole rule up so that they wouldn't get surprised at the end.

You wouldn't want to be surprised at the end if that turned out to be a problem. That's number one. Number two, Marc made some points to some of the information needed to pin down how you do this.

It's hidden away in the NRC codes. Can somebody clarify that? Because that doesn't seem to make sense.

MR. RECKLEY: Currently, the most common way to assess the meeting of the QHOs is through the codes like MAACS that includes within it models based on isotopes and organs and data that's available on health effects or life-threatening levels associated with those various organs and isotopes.

So I'm not an expert in that but, yes, it is within the codes, it's not necessarily specific TEDE numbers like 1 rem because it's divided up depending on the organs.

But again, we've been doing this for years. If that needs to be elevated up to regulatory guidance, I think we're probably at a point where we could look at that if that's important.

MEMBER BLEY: That seems to make sense, I know would have reviewed any of these things specifically that I recall and if it is a problem for some potential Applicants in figuring out how to

design to that, it might be helpful.

I hadn't really thought or heard about this until today so I haven't thought it through yet but thanks Bill, that's all I had. I see Vicki?

CHAIR PETTI: Yes, Vicki, you have your hand up?

MEMBER BIER: I have a general question about the Type A and B or whatever of the four different approaches that you laid out and the pluses and minuses, confirmatory versus whatever the first one is called, I forget.

They would go. So it seems to me there really are some very different pluses and minuses between the two.

In theory, I understand that using PRA earlier in the design process and as a leading contributor to design may avoid some problems, more sensible choice of licensing basis events, all of that kind of thing.

But since we don't have a lot of experience with PRA used at such an early stage, I wonder in my own mind whether it's really the best place to use it.

First of all, we've seen over the years that PRA is good at finding problems that were not

identified in the design stage, and if we put it earlier do we lose that confirmatory role?

And more specifically, at least for current LWRs, maybe some of the new designs are simple enough that this may not be quite the same but for current LWRs, the design process really is very compartmentalized.

You're assigned to design a particular system or your group is assigned and then you have some boundary conditions, what electric power you have, what flow rate you're supposed to provide or whatever else.

But it's really almost blinders on about how that subsystem interacts with other things that may be going on in the plant, and the fact that the PRA integrates across all the subsystems can find places where those boundary conditions maybe don't always hold or were chosen conservatively or whatever else.

So I don't know if you guys have any thoughts on the pluses and minuses of Types A and B or just that you think they should both be available and people should be able to use whichever they wish?

MR. NICHOLS: We're more of the position that different designers want to use different

methods and they should all be allowable. I think you point out a lot of good pluses and minuses. Which method is best for you probably depends on what does your design look like?

How confident are you in either the deterministic approach or probabilistic approach to doing certain things within this? You did ask the difference between Example A and B.

Now, for non-LWRs both would use the ANS ASME ANLWR PRA standard. So they would both meet that PRA standard. The primary difference is I think you're familiar with 1804, the leading role, where PRA is doing all of these things.

They're demonstrating compliance with the limits, they're establishing the safety functions in PDC, the PRAs selecting the LBEs and making the categorization, and even doing the defense in-depth is all PRA-based.

Whereas Example B, which would be that same method but the PRA is confirmatory, would have more deterministic things.

So for example, in meeting the safety limits it would be a more deterministic analysis, which means you're using conservative rather than realistic assumptions in those analyses.

Where you're doing the design criteria, PDC, those are coming from things like ARDC rather than being defined by the PRA.

Similarly, for identifying LBEs or something, that might be deterministic based on engineering principles and understanding how the design works rather than just using a PRA to develop that information.

So those are some of the differences. But in terms of the analysis work, it's all the same. It's just which part are you hanging your hat on and saying I have confidence in safety?

MR. DRAFFIN: This is Cyril Draffin from U.S. NIC. Just to reiterate, the developers think the PRA is important and they'll be doing it. They don't want to have to pick from the three categories that NRC has or the four examples listed here.

They'd like to be able to craft it to be more effective for covering the safety for their technologies. And so they're looking for that spectrum of use rather than picking one versus another one.

Because frequently it's a blend.

MEMBER BIER: Thanks.

MR. NICHOLS: And we do have slides at the

very end that explain the different examples, Slide 72 to 75 in our September paper. We can give it to you if you don't have a copy, but our September paper goes into a lot of detail on how those work.

There actually is a small section in the back which is a here's where each of these might work better than others.

CHAIR PETTI: We got the paper, Marc, thanks. Let's just keep on going.

MR. NICHOLS: Cyril, you're next with the standards.

MR. DRAFFIN: Sure, I'll pick up on this and by the way, you have a hard copy and for those listening in, the slides have been posted in ADAMS ML21350A212.

The topic here was discussed really back in the February timeframe when the NRC changed their approach for standards.

And so we'd like to just talk about the standards for the Atomic Energy Act. And again, my name is Cyril Draffin, I'm Senior Fellow for Advanced Nuclear at U.S. Nuclear Industry Council.

The statutory requirements in the Atomic Energy Act in Section 182 and 161 are well known to you, and as a matter of fact, Bill referred to that

just a few moments ago.

In the NRC first iteration of the preliminary rule language, they tied back to the AEA standards for Part 53.

However, in the second and third iterations of the preliminary rule language, we think they reduced clarity because they came up with different standards that do not clearly relate back to the Atomic Energy Act and seemed to have no regulatory precedent.

The language it used limited the possibility of immediate threat to the public health and safety considering potential risks to public health and safety.

So we'll look at first the written comments that NRC made and then the verbal. So this is out of the second iteration of Subpart B. The ones in yellow are just highlighting things we might want to discuss or at least mention on the way by.

The change revised the first objective from getting away from a reasonable assurance of adequate protection to a new terminology and this new language generally aligns with the standard of the Commission that has been used to determine the content.

And it also revises the public health and minimized degree to something different. And the purpose of these objectives is clarified because I needed to explain the purpose by saying it will be carried out by meeting the safety criteria.

So if you meet the criteria then you meet the new language because it hasn't been used before. And again, this is quotes from the discussion the NRC provided.

This change resulted from stakeholder comments and internal NRC discussions regarding difficulties in this act as a basis for their two-tiered safety criteria framework.

So instead of the use of adequate protection, it's presumed that through the compliance of the NRC regs, and the particular sections of 182, 161 will not be cited just as standard legislation but not tied to safety objectives or tiers.

Then during the public meeting, I think it was around April 8th, in discussing this change the NRC Staff explained that because the entirety of Part 53 satisfies the Atomic Energy Act, the new standards don't have to be referenced in Part 53 and NRC could establish new standards defining requirements.

So as an observation, it seems that this

change was made in support of a two-tier structure and that has now been dropped responsive to ACRS and industry comments.

It also refers to stakeholder input and I'm not exactly sure what that is. Industry was supportive and still is supportive of tying it back to adequate protection and so it wasn't U.S. NIC or NEI that was recommending this change.

So it might be the NRC's internal activities. And the approach seems inconsistent with the long-standing practice of the NRC and appears to not follow the decades of Commission precedent and hasn't really provided a compelling benefit or an indication that Commissioners have supported that.

We also have some concerns regarding the new approach, that it will take some extra resources, that you will have to invest the Staff to ensure consistency with AA. And it doesn't help in terms of regulatory clarity or efficiency.

There's no clear connection between these requirements and the standards in the act, there's no equivalency in Part 50 or 52. There doesn't seem to be any regulatory precedent.

And we're also concerned it could expand NRC's regulatory control beyond what is in place for

existing reactors without any breaches in safety. It appears to be a regulatory overreach and there is no explanation of what the new standards mean and we rate to all parts of Part 53 other than just changing some of the language.

So we raised this as a concern and this lack of clarity on how the requirements tie back, and the industry is a strong supporter of adequate protection.

There are some questions on exactly how to interpret it but there has been lots of precedent and decisions made and clarifying memos that have really given pretty good understanding of the case law and an understanding of how it works.

And if you move to this new language, you might have some iterations and challenges to be exacerbated in trying to tie it back to these new standards as we go down the road.

So we're recommending that the NRC goes back to the first iteration and keep the connection with the Atomic Energy Act. Certainly, we haven't heard from the NRC on this since but the NRC may benefit from ACRS's perspective on this.

So that would cover this Section and of course, if you have any thoughts or comments I'm happy

to hear them. If not, then the next section would be on regulatory burden. Go ahead.

MR. NICHOLS: Thanks, Cyril.

So what we're going to cover is a couple of the areas we identified. practically is increasing regulatory burden as compared to Part 50 and 52 but without increasing the commensurate level of safety.

And this gets to the point where both Part 53 and 50 and 52 get you to the equivalent point of safety. It's a matter of how you get there more efficiently.

And while certainly, we're not advocating that Part 50 and 52 is what you have to base it on, it is helpful to know, well, is it done in 50 and 52? And if it's not done there, why would it need to be done in Part 53?

There may be a valid reason for doing that but at least it should be discussed and decided deliberatively. Let's go to the next slide, Cyril. And so this is our overview.

I don't want to spend a lot of time, I know we're running behind and I'm going to get into the details behind this, but it's basically saying we're looking for the most efficient Part 53 possible.

Really, put yourself in the place of an

industry that is going to choose do I license under 50 and 52, or do I license under Part 53?

By the time we get to Part 53 believe available in 2025, we will have licensed non-LWR and other advanced reactors under 50 and 52, we will know how to process exemptions based on technology-specific things in Part 50 and 52.

We'll be really good at that. And so when you look at Part 53, the only incentive 2 use Part 53 over 50 and 52 is if it's more efficient, either in the licensing, the time, the cost of licensing, or in the oversight, or in the cost of the design itself.

And so you're getting to the same level of safety. And so if Part 53 is not more efficient in getting to safety, there's not a lot of expectation that it's going to be used.

So let's go onto the next slide. I want to cover four areas, ALARA being a design requirement, beyond design basis event in the design basis, a proliferation of redundant and unnecessary programs and then finally, safety program as part of that.

Let's go to the next slide and start with ALARA as the design requirement. So we do support ALARA, we think ALARA is a very important part of the operation of a nuclear power-plant and we think it has

great benefit.

However, we recognize Part 53 does not need to have any requirement for ALARA. ALARA as a requirement already exists in Part 50, sorry, Part 20. And regardless of any ALARA requirements in Part 53, that Part 20 ALARA requirement will apply to all plans licensed under Part 53.

So boom, ALARA is already covered so the question is what benefit would there be in providing any requirement related to ALARA in Part 53? Now, it could give clarity that, hey, you need to go meet a Part 20 ALARA requirement, that would be fine.

But that's not what is in the NRC's Part 53 rule text as it stands. Let me start with what the Part 20 ALARA requirement is today, and that is you must use, to the extent practical, procedures and engineering controls to achieve ALARA.

And so those are radiation protection programs.

You must implement a radiation protection program to ensure compliance with Part 20 and it's noted that there are no requirements for the design to consider ALARA within all of the Part 20, however, this is what NRC's Part 53 requirements have for ALARA.

They're in 53260B and 53270B. I want to point out we have no problem with 53260A and 53270A which basically points to the dose limits for normal operations to the public and for occupational workers.

The B provisions unfortunately do have some problems with them. So it essentially says design features and programmatic controls must be established.

So right there it's establishing a design feature for ALARA in conjunction with programmatic controls, which is your radiation protection program.

270B says the same thing. It goes a little bit further and says as required by Subpart B of Part 20, that would be an incorrect statement because Subpart B of Part 20 as I showed just above does not require design features on the programmatic controls.

So this establishes that Part 53 is requiring design features as it stands. Next slide, please.

CHAIR PETTI: Marc, before we go there, when I read this, I think of some advanced reactors as having some design features that might obviate some programmatic controls, if there's a trade-off here that doesn't exist in LWRs.

They have features that may make it much easier from a radiation protection standpoint for workers, for instance, and that you'd want to be able to get some relief on purely the programmatic control side because I've got these cool design features.

My favorite is NHTGR. You could have stood on the top of Fort St. Vrain without a film badge, that's how the low the dose was. They had to have a film badge by law, by requirement, but that's what I thought this meant.

So I'm thinking maybe it should have been or in 260B, but there's that feature there that I think might be important and give some flexibility if you will.

MR. NICHOLS: Right, it is important and I'll address it either in the next slide or the slide after this. I'll show how Part 20 already allows that flexibility. But yes, I agree that flexibility is important.

Next slide, please.

So, first, in ALARA design requirements it's not consistent with passed Commission decisions and I reference here the Federal Register notice. I think those are all statements of considerations for the rule.

So some of the statements that are in there, direct quote, the ALARA concept is intended to be an operating principle rather than an absolute, which Part 20 is consistent with that today.

I don't think the Part 53 requirement as proposed is consistent with that. The ALARA can be achieved solely through implementation of the licensee's radiation protection program required by Part 20, that's a paraphrasing of what is said.

But it basically says the radiation protection program is fine, you don't need a design requirement for ALARA.

And here it says expressly intended that the level of this program, the radiation protection program, and efforts to document it are commensurate with the size of the license facility and the potential hazards from radiation exposure and the intake of radioactive materials.

And David, I think this gets to your point, which is the Part 20 ALARA requirement already had this envisioned, which is the programmatic controls for ALARA are to the extent it's needed for that design.

If you have a design like the one you just mentioned, maybe all you have are those badges you

talked about. If you have a different design, let's just talk about our operating reactors right now, you have a radiation protection program that's in place for those.

So it allows for different approaches to ALARA based on the aspects of your design.

So with that, the ALARA as a design requirement would increase the regulatory burden without a safety benefit because you're already achieving ALARA or you can achieve ALARA through the radiation protection program alone.

But having a design requirement in there is an increased burden. Why? Well, there's no practical endpoint for these additional measures. It's less of a negotiation between the NRC and the designer and the application review stage.

So the designer comes in and says here's my design, and I meet the dose requirements, the 1 rem for the public, the 5 rem for the occupational, and I've got a radiation protection program.

And the NRC says, well, wait a second, I've got this requirement that says you need to design for ALARA and I want to see where you've designed for ALARA. And the Applicant says, well, I've got these walls and doors and other things.

And the NRC says, yes, well, that's not ALARA to me. The designer says, well, it's ALARA to me.

And so the question is where is that objective criteria that you can say, yes, ALARA has been met? It's in the eye of the beholder, it's very subjective.

And so in the radiation protection program, not an issue, we know how to deal with that in terms of programmatic controls. In the design, a big issue because what the NRC could say is it's not all ALARA enough for me.

That wall that is X feet wide, you need to make it wider. And the designer says, okay, I'll make it wider. There is a cost to that in terms of the cost of the plant because concrete is cost.

But what if you get to a practical limitation where it says, wow, okay, to do that is going to impact my ability to construct the plant because I had all these things lined up in terms of room sizing and onsite mobilization of the onsite construction workforce.

It has tentacles that progress far beyond just the application review and the subjectivity of what is ALARA for this application, recognizing that

all of that complication is not necessary because ALARA has been effectively addressed through programs for decades.

We think because of all that, it's really inconsistent with the development of a risk-informed performance-based and the efficient regulatory framework for advanced reactors, which Part 53 should be.

Next slide, please.

MEMBER HALNON: Marc, this is Greg. There is a place, though, in the design and I would say more in the plant layout for consideration of radiological issues.

I'd go back to a point where I was designing once or helping design and there was a certain activity an operator had to do but it was in the end impossible because of the dose rates.

So the plant layout is still important. Where do we deal with that? Because if we don't do it in the design process, you talk about expense, changing the plant after the fact is even worse.

MR. NICHOLS: No, I agree that changing the plant after the fact is worse and I don't know the specific details of the example you just provided. I would point, though, that there's already a

requirement for occupational workers of 5 rem.

And so the Applicant is going to have to show that the workers can accomplish all of the tasks they have to do still below 5 rem.

And then beyond that you take a radiation protection program and say, well, how can we get it below 5 rem? How can we get them down to 1 rem or 0.1 rem? So you would still meet the regulatory requirement within the application review and the design would have to do that.

What we're saying is beyond that, beyond 5 rem, which the NRC by the nature of its requirements has said is an acceptable dose for workers, to go even lower than that we think the design isn't where you focus, it's the radiation protection program where you focus.

MEMBER HALNON: I agree. There's a place for it in the design but we need a bright line to design to and I've got that, thanks.

MR. NICHOLS: Absolutely, that's what I was trying to say. Next slide.

So the NRC at the Commission briefing on December 9th told the Staff told the Commission it's not their intent to elevate the ALARA as a design requirement, and we appreciate that. We're glad to

hear that.

The statement was well perhaps the design requirement for ALARA is going to be an option during the design and that provides flexibility, I think I talked about why that flexibility is not needed but let me go into some more detail here.

I do believe the Part 53 requirement that I mentioned, the 260B and 270B, they don't achieve the NRC's intention, as I discussed, because they do require design features programmatic controls that doesn't allow an option that is a requirement.

But it is also unclear, how would an option for ALARA, if you have a design requirement, the way it's phrased, the NRC has it now where even if they were to change it, there was basically a design element required as part of ALARA, how would it work?

Here are some questions I thought through. If the Applicant meets the requirement for design to achieve ALARA and the NRC says yes, that design achieves ALARA, would the NRC then say you do not need to consider ALARA in your radiation protection program?

If the NRC is saying that then, okay, that's something we should be talking about. I can't imagine the NRC would say you've met ALARA in the

design, you don't need to consider ALARA in your radiation protection program.

But they could be saying that, we don't know.

The second question I'd ask is, well, if you have this voluntary design requirement for ALARA, you don't have to meet a design requirement but it's voluntary, and if you do meet that voluntary design requirement for ALARA, you still have to achieve ALARA in the radiation program, who would want to do that?

You'd have to both design for ALARA and then have a radiation protection program for even more ALARA when we already know that the radiation protection program is enough for ALARA. So I can't imagine very many people would want to do that.

So now I'm getting to your point, Dave, which is having that flexibility is important. Even without a design requirement for ALARA, the developer can still optimize their design for addressing the ALARA.

So the developer can still say, well, I've got this high radiation dose in this room and if I don't do something in design space, then the radiation protection program is just going to look very convoluted and complex.

And so let's add in these design things so that we can minimize the scope of the radiation protection program for ALARA. Part 20 already allows that. We don't need a requirement in Part 53 to allow that.

So the question would be is there really any flexibility that an ALARA design requirement could provide above what we have today?

I don't believe it could so I think the best solution is just to delete the ALARA requirement completely from Part 53, we don't need it at all, by specifying in 260A and 260B that you have to meet the dose requirements and you have to meet Part 20, already by extension you need to meet ALARA.

If the NRC wanted to retain ALARA for some reason, I suppose they could include a requirement in the operations program section specifically pointing to a radiation protection program that needs to meet ALARA.

That would be consistent with Part 20 but certainly nothing in the design section. So let me see if there's any questions before I move on to the next topic.

MEMBER BROWN: This is Charlie Brown. I've been involved in a lot of radiation shielding

discussions in my old program and I'm trying to understand the difficulty of meeting dose -- I mean the concept of meeting dose requirements.

But meeting dose requirements requires shielding from the standpoint that you've got a reactor and you've got to shield it, you then have to have exclusionary areas or zones where people walk into and they can't go into there when the reactor is operating, or they can.

And it doesn't matter what kind of reactor you've got, we've always got fissionable material in there fissioning away. So a program doesn't achieve dose requirements, shielding achieves dose requirements.

And the ALARA things, from what I remember dealing with was when you were doing maintenance or other types of operations, you had a program to minimize the radiation exposure of the people doing the work, the maintenance, where they were doing their monitoring for operations and things like that.

So I'm having a little bit of difficulty, and I'm trying to balance what you're saying about the ALARA being a design requirement because where do you draw the line on ALARA?

But you've got the dose requirements and

I don't see how you can get away the way in which meeting dose requirements without designing a plant to meet those requirements, which is a lot of shielding in a lot of different areas based on where you want to work and why.

MR. NICHOLS: We agree with that statement, that you have to design to dose requirements and you're going to have to have shielding to achieve those dose requirements.

Those are accomplished by 260A and 270A.

That's what we're saying, you've already accomplished those dose requirements, you're already showing through your design that you're meeting the dose requirements.

What the NRC is requiring here, which they've never done before, is requiring an unending search for ALARA within the design. And so the question is you've already met the dose requirements that are acceptable in the design, why do you have to design for even more?

Because it's more difficult to address it through the design than it is to address it through the radiation protection program. You can put up temporary shielding in certain places if that makes sense in order to achieve ALARA.

MEMBER BROWN: But you're not arguing that -- I lost my thought here. This is what happens when you get old.

You're envisioning that regardless of dose requirements, they should be designing to meet dose requirements lower than the required dose requirements?

You're saying that's the way it could be argued by the NRC?

MR. NICHOLS: Correct.

MEMBER BROWN: So the dose requirements become meaningless if somebody is always jacking you down a little farther?

MR. NICHOLS: Exactly, that's exactly what we're saying.

MEMBER BROWN: I don't know how to balance that, I used to stand right next to the shield when I was doing submarines sea trails and I walked away after 35 years of 15 sea trials, 2 carrier sea trials standing by the reactor compartment walls, and I only had 235 millirem over my lifetime.

So I'm trying to balance what I saw in our program. Of course, we had sailors living right next to us constantly. So it's a bit of a different circumstance from the commercial world.

I'll quit asking, I just wanted to see what your understanding was. I understand your point about putting it in would something like there's always a jack that somebody could be putting on you as opposed to meeting the dose requirements.

I'll stop there.

CHAIR PETTI: Marc, I think the first bullet on the slide is very important. It seems that was not their intent, so you may see some movement here.

MR. NICHOLS: Thank you, and Dave, can I ask --

(Simultaneous speaking.)

MEMBER BROWN: I agree with you on that standpoint, that's an important line. Thank you, Dave.

CHAIR PETTI: What was that, Mike?

MR. NICHOLS: I know we're around the time we were supposed to end our presentation. I'd like to be able to present on beyond design basis events in the design basis at least.

I don't know if we have additional time granted to us or not?

CHAIR PETTI: I think we're okay because this is all we have on the agenda, right, and then

discussion time?

MR. WIDMAYER: That's correct.

CHAIR PETTI: I'd say we've been going at it for an hour, so we might want to do a break. Let's get through this and then...how many slides on BBBE?

MR. NICHOLS: I think there's about six. Let me see, no, four, there's only four.

CHAIR PETTI: It's showing me five slides in all.

MR. NICHOLS: I see that. I would recommend trying to get through beyond design basis events before the break. That would be my recommendation.

CHAIR PETTI: That sounds good, let's do that.

MR. NICHOLS: So industry had a concern that for Part 53, the NRC is expanding the design basis to include the beyond design basis. Now, we recognized and agree that beyond design basis needs to be part of the licensing basis.

There's a big difference between being part of the licensing basis and being part of the design basis. So design basis means you need to design to the beyond design basis events.

The licensing basis means you need to be

able to address beyond design basis events, typically in mitigation. So again, in the December 9th Commission briefing, the NRC Staff stated, well, the Part 53 benefit is that you do more upfront and you get downstream flexibility.

And I think that was in response to the beyond design basis event requirements. But the Staff also said it wasn't the intent to include the beyond design basis event in the design basis, so that was good to hear.

We are encouraged by that. They did say within Part 53 beyond design basis events created the same way it is today and specifically, the beyond design basis event doesn't need to rely on safety-related SSCs.

I'll explain why I disagree with the first point, which I think Part 53 treats beyond design basis differently than today. But I would agree with the second point, that you don't have to meet it with safety-related SSCs.

So as a reminder, Part 50 and 52 requires the mitigation for the beyond design basis events. You do have to identify the beyond design basis events but then you have to mitigate for them.

You don't have to design to protect

against them or design for them. That's in 50.155. It's a recent rulemaking in the NRC.

So Part 53 requirements I don't believe achieve the NRC's intention that they described to the Commission on Part 53. So first of all, Part 53 does require mitigation for a beyond design basis events.

And so that would be consistent with Parts 50 and 52 and that's all you need to do in order to be consistent with the way they're treated today.

However, Part 53 goes beyond that and actually, as I'll talk about, it's the QHOs in the rule that is the door through which the beyond design basis events is included in the design basis.

Because Part 53 also includes requirements for designing for the beyond design basis events. So specifically 53400 requires design features for 20, requires functional design criteria, for 40 it establishes design requirements, for 60 requires special treatment.

And that special treatment, the way it's described, it's described exactly the same way as it's described for safety-related SSCs.

We have a whole other issue that we didn't put in our presentation today about concern about the NRC's elevation of non-safety-related to be treated as

safety-related in the way the rule is written up.

And all of that relates back to the QHOs in the Rule 220. I'll point out we don't make a lot of comments on Part 5X but Part 5X also includes beyond design basis events in the design basis.

Again, the NRC said that's not their intention but that is the effect of the rule, as we see it. Next slide, please.

So we believe that including the beyond design basis events in the design basis is inconsistent with Commission decisions, that it should just be in the licensing basis.

So this is the mitigation of the beyond design basis event pool that I talked about. The Commission directed the Staff to remove representation requirements for the beyond design basis events for new reactors that the Staff had proposed in that rulemaking.

In doing so the Commission recognized that the NRC's ability to provide oversight for mitigation was sufficient to address beyond design basis events for nuclear reactors.

The Commission specifically noted that the requirements should not establish a separate standard for new reactors and it said a more flexible approach,

which is mitigation, is preferred over design requirements for beyond design basis events.

And finally, the advanced reactor policy statement has led to designs that reduce reliance on human actions. We think it's already providing the incentives that are needed.

That was actually a statement of the Commissioners, rejecting the new requirement for new reactors to include beyond design basis in the design basis in that MIDI Bede rule.

Because it says it allows the Applicant or new reactor to provide innovative solutions, mitigation does that. Regulatory requirements should not impose unnecessary burden or divert attention from more important safety objectives.

That is certainly occurring here.

When the beyond design basis now comes into the design basis and if you look at this previous slide, all of those requirements for design features and functional design requirements and design requirements are the same things that are required for design basis events.

And so it really blurs the line between you're doing the exact same thing for beyond design basis as you are for design basis.

The only difference being that the beyond design basis events don't have to rely on safety-related equipment and what's the difference between safety-related and non-safety-related with special treatment?

According to Part 53, there's not a whole lot of difference and we can go into that in another meeting. Next slide. So what is the solution for this?

Keeping the QHOs in the policy and not putting them in the rule since they drive the beyond design basis event design basis requirement. We already talked earlier about putting QHOs in the policy.

I'm going to reflect on the NRC's feedback because I found it to be a bit circular logic.

When we ask them why are there prescriptive PRA requirements, you have to do a leading role in Part 53, this was at the October 28th meeting, they said, well, you have to do PRA that way because we have QHOs in the rule.

When the ACRS just asked the NRC why do you have to have QHOs in the rule, the response was we have to have QHOs in the rule because we are prescribing how you have to use the PRA in your

licensing basis and therefore, we need a metric to compare them to.

I find it circular, one feeds the other. You need one to have the other and you need the other to have the one. So I find that particularly troubling.

If that's truly the logic, I think there's a good reason you can take them both out and not lose anything within the rules we've described earlier. So what would our solution be?

The earlier question is, well, if QHOs aren't in the rule, what do you do in the rule?

And so this particularly focuses on beyond design basis events. I mentioned this briefly earlier, for AOOs you can put a 1 rem requirement if you want.

For beyond design basis events, the Commission has been very deliberate not to put in dose limits or I'd say metrics for beyond design basis in the rule. One, it drives you to having to design to those.

And so the solution, which I think works very well for the operating fleet and would work equally well for advanced reactors in Part 53, would be to continue rely on mitigation of beyond design

basis events.

And in our comments on November 5th, we proposed a more technology-inclusive version of 50.155 for beyond design basis events.

And this is the requirement that we had proposed to replace the QHOs and that is that each Applicant or licensee shall develop, implement or maintain mitigation strategies capable of being implemented sitewide.

Now, I will say I'm about to read through this and these are performance metrics. They may not be quantified but they are performance metrics and I think that's really important to note.

The question now becomes, the NRC previous said, we have to have a numerical performance metrics. What we're saying here, the industry is proposing that qualitative performance metrics are the right approach for beyond design basis events.

So what are those performance metrics? Well, the mitigation strategies must be able to maintain or restore the safety functions necessary to meet the safety criteria in 53210, that's 25 rem.

So as you identify your beyond design basis events, as you identify the plant response to that, you might do it all with a PRA leading or you

might do it with a PRA confirmatory.

As you do that, you have to identify, well, here are the safety functions I might lose under this beyond design basis event that would cause me to exceed the 25 rem.

And so now I have to develop mg8 strategies that give confidence that I would be able to maintain or restore those safety functions and not exceed 25 rem.

Now, we think that provides the bulk of the benefit for beyond design basis events consistent with 50.155 and we think the right way to go about it.

The second criteria would be you'd have to be able to acquire and use offsite assistance and resources to support the capabilities of A. So this is building in some redundancy in defense in-depth, not just onsite systems, you've got offsite systems, FLEX, for those that are familiar with it.

And then finally, the strategy and guidance that you're providing for that Capability A have to be capable of I'll say handling the circumstances associated with loss of large areas of the plant due to explosions, fire, minimized radiological releases.

So you have to consider all these other

things as you develop the mitigation. I think that provides a lot of confidence in how an advanced reactor would address the beyond design basis events.

And so that is why the QHOs would not be needed in the rule because you're already addressing it adequately with this. Was that the last slide or was there one more, Cyril?

MEMBER KIRCHNER: Mike, this is Walt Kirchner. Let me ask you a rhetorical question.

I've got the advanced reactor policy statement in front of me and one of the things it's looking for is designs that minimize the potential for COP accidents and their consequences, providing sufficient and inherent safety, reliability, redundancy, diversity, and independence in safety systems with an emphasis on minimizing the potential for accidents over mitigating the consequences of such accidents.

Now, you're talking about mitigation. So how do you see the industry?

We hear a lot of good things about these reactors but what do you see in 10 CFR 53 driving you to provide the emphasis on prevention rather than mitigation?

MR. NICHOLS: That's the unique thing

about the advanced reactor policy statement, is the Commission intended it to be a policy to encourage these things but not a requirement for those things, as a way of encouraging innovation.

And I would say that's been the effect. If you look at the advanced reactors and the designs they're look at, they're look at putting in features that would minimize and prevent the potential for an accident, even a severe accident.

And so if you look at TRISO fuel or if you look at other things that operate at atmospheric pressure, simplification of systems, smaller source terms, they're headed in that direction to do that naturally.

So you asked, well, what do we see in Part 53 that requires it? I would say that the Commission never did Part 53 to require what's in the advanced reactor policy statement.

But what I would say is as we look at how does Part 53 ensure safety, first and foremost, it focuses heavily on the design basis events and ensuring that those are adequately designed for and protected against, and that you are less than 25 rem.

The requirements focus on normal operations, protection of occupational workers, AOOs

are even included in there. And then the big question which I think this is all related to is, well, what about beyond design basis events?

And so I would think our view is this requirement that's on Page 39 is the appropriate way to do that.

QHOs would not be appropriate because it brings all of that stuff into the beyond design basis, it brings it all into the design basis inconsistent with the Commission direction as what the Staff said December 9th, inconsistent with their intent for Part 53.

And so if you've already assured that through this, why do you need the other QHOs? I would say you bring up an interesting point that if these advanced reactors are designed so that there are fewer potential accidents, the consequences of the accidents are a lot less.

There's a lot less reliance on human actions to even mitigate accidents, even beyond design basis events.

The mitigation strategies would reflect that and so you would probably see mitigating strategies that are slightly different from what the operating plants have today.

MEMBER REMPE: Along those lines, you may need something different than the standard FLEX equipment for some of these designs, right?

MR. NICHOLS: That's right, absolutely. Depending on the design, you may have a completely different strategy.

MEMBER REMPE: And so that'll have to be something that's thought about? I don't know, in your paper did it mention that point?

MR. NICHOLS: Yes, I think we mention that, absolutely, and I would say even in the NRC's version of Part 53, they do require mitigation of beyond design basis events.

So that issue about, well, it's a new design and so what does mitigation strategies look for, for a new design the NRC hasn't considered, it's true whether you go with our approach, which is replace QHOs with this EBBE requirement or if you go with the NRC's current version.

MEMBER REMPE: And so when I say the equipment, I just don't mean the equipment on the site, I mean the regional centers. They may not have exactly what's needed for the beyond design basis accident mitigation strategy.

So the design developer, if they go

forward and start to build this thing, as part of their licensing approach they'll have to say yes, we're going to have X, Y, and Z equipment added to the regional center to address our particular design.

MR. NICHOLS: That would be one solution, I won't foreclose on other solutions but that would be one.

MEMBER REMPE: Because I don't think I saw that in your paper is what I was speaking about.

MR. NICHOLS: We didn't get down to those details, that's right.

MEMBER BALLINGER: This is Ron Ballinger. As long as they achieve the top-level goals, how they do it, who cares?

MEMBER REMPE: True, but it's something the Staff needs to look at.

MR. NICHOLS: I would say the Staff and the design are here but in terms of the requirements in the regulations, it should be indifferent to the particulars of the strategy. It's focused on the performance criteria.

MEMBER BALLINGER: Remember, FLEX was implemented after the fact.

MEMBER REMPE: But because of FLEX, other requirements were deemed unnecessary because it

couldn't pass the cost-benefit criteria for backfits. So they need think about that.

CHAIR PETTI: Any other comments, Members, before we take a break? Hearing none, let's break 15 minutes, so 25 after the hour. Thanks.

(Whereupon, the above-entitled matter went off the record at 4:11 p.m. and resumed at 4:20 p.m.)

CHAIR PETTI: Okay, go ahead.

MR. NICHOLS: Okay. All right, the last area I want to cover are operational programs in Part 53, and that includes the facility safety program. And we presented this, the next set of slides, to the NRC, I think it was in the October timeframe.

But one of the things we kept hearing (audio interference.)

Somehow my cellphone was muted, but I, fortunately I'm still on the -- a computer.

So one of the things that we heard in the feedback from the NRC on operational programs is -- or design requirements. All the stuff we just went through, they said, well, you got a more up-front regulatory burden on design, but you're going to reap the benefits in less regulatory burden on operations.

And so when they came out with their operational requirements for programs, we found that

that didn't appear to be an accurate claim. So what we find, here's just some statistics here that we think the NRC needs to reassess the entire set of program requirements for Part 53.

We have 11 program areas that have equivalents in Part 50 and 52. Thirteen areas, program areas, in Part 53 don't have Part 50 and 52 equivalents, or they just duplicate others.

Now, it's not to say that just because there's no program in Part 50 or 52 it doesn't deserve a program in Part 53. It might, but to recognize that there are more program areas without a 50 and 52 equivalent than there are with 50 and 52 equivalent really -- really shows that something's out of -- out of balance.

And then there's over 20 instances of an open-ended requirement for programmatic controls where there's no performance criteria and there's really no -- nothing in the requirements that could limit with the NRC would ask for under there. So let me go to the next slide. All right, thanks.

We evaluated all of the program areas that are being required in Part 53. Again, it's, well, asking you the question is there a 50 or a 52 equivalent. And if not, is there a need for Part --

for that program in Part 53. So the first set of lists is on the left are Part 53 program areas that are required. And Part 50/52 or equivalents we found that for many of them, there are one for one correlations.

Now, what the details of the program requirements, we didn't get into the analysis here. They could be different. But at least from whether the program areas require it at all is consistent in these 11 areas. Next slide, please.

What we found is that there are a lot of program requirements in Part 53 that are essentially duplicating the Q&A program requirements out of Appendix B. Now, the NRC did split up QA requirements across Part 53, and we've recommended they consolidate all them together. I think they are doing that, and so that will be helpful in its own way.

But nonetheless, even when they do that, there are some requirements -- design QA requirements tend to be one where I think there's three or four individual requirements all related to the -- achieving the same exact thing, design control quality. And so we recognize that these requirements could be simplified and replaced with just a single QA requirement. Next slide, please.

This is the list of all the programs that are required in Part 53 that have no equivalent in 50 and 52 and a summary of our analysis on whether it's needed or not needed. In all cases we've determined that it's not needed, usually, because it duplicates another program that was already required by the previous two slides.

And so that -- and then there -- the one -- there's, two, especially, that don't have any duplications or requirements. One is the facility safety program.

So we looked at that, and it essentially duplicates all other programs. It is a way that -- of performing a periodic safety review, which the NRC has made Commission decisions in the past that that is not something that would be adopted in the United States. It's more akin to what they do in Europe.

And by way of implementing that period safety review, which is not every ten years, based on that facility safety program it's every two years because it's tied to the frequency of updating the PRA. So every two years, as you update your PRA, you need to reevaluate the plant and make plant modifications based on your findings there.

Now, they do have some cost metrics to

evaluate. But outside of those cost metrics, it actually circumvents the backfit protection because you're required to do it, and so you just get around the backfit protection.

We think because it duplicates all those programs and has all those other challenges, the facility safety program needs to just be thrown out altogether in Part 53. In fact all of these programs here need to gotten rid of, because they're adding programmatic burdens and operations without any safety benefit in Part 53. Next slide, please.

So with that, my personal assessment of how the NRC went about programs is sort of a one here, a one there, sort of this sounds good and put it in. I don't think -- it doesn't reflect a very systematic and process of thinking through what programs should be in Part 53 and why they should be there at all. It's a dramatic expansion of the regulatory footprint.

This slide here shows those 20 requirements that are for programmatic controls, and it says basically whatever the NRC might ask for in a review, and so that is very open-ended, and it's not certain why you need additional programmatic controls outside of the program areas already being required. Next slide, please.

So we've proposed to the NRC that they should take a more systematic, thoughtful approach to the role of programs to define which programs are needed. So in our assessment, as you look at what the nuclear power plant has, we've bunched some things together, called them the technical aspects of the plant to protect the public.

So the technical aspects are the design features. So this the systems, structures, components. This the physical stuff. And then you have human actions, and then you have programs.

And so what is the role of the program? Well, the role of the program is to make sure that the design features that you've got built into your design basis approved by the NRC and those human actions which are being credited in the safety -- safety basis will actually perform how they're expected to perform in the licensing basis. They'll actually perform that way in operations.

So that should be the role of the programs. It shouldn't be every good thing that we think we could control at the licensee's operational programs should be included as a requirement. And I'll go through a couple of examples of these.

It should also recognize that the NRC

requirements are in effect even after the NRC issues a license. So just because you have a requirement for something doesn't mean you need a program for it. You need to be thoughtful and say well, do I actually need a program to give me reasonable assurances this is going to be performed.

The NRC has oversight and inspection program to ensure compliance. And so that is another key tool that the NRC needs to recognize that is in their -- their quiver for assuring reasonable assurance.

And we also know, we should actually start with the understanding that the QA program itself provides a lot of the assurances that we're looking for here. Next slide, please.

So what is the systematic approach? Well, we've looked at, we actually put together our thoughts and went through a systematic thought process of well, this is the role of the programs. What programs might you need. We looked at it as well each stage has its own purpose. So you need programs in the design stage to provide reasonable assurance to plant design as in accordance with the license and regulations.

You need a program in the manufacturing and construction to provide reasonable assurance that

those -- that the constructed and fabricated SSCs are in accordance to the license and regulations.

And maintenance and operations, you need programs to provides reasonable assurances that the SSCs are capable of performing their intended functions, that's maintenance, and that the plant is operating according to the license and regulations.

So those are the purposes for programs that we established. And then the next would be well, what are the criteria for such programs. They should be graded so that if you need more in your program, you have more. If you don't need so much, you don't have so much. And then they go to the next slide.

I won't spend a lot of time on these. There's four slides where we actually did the effort. So at the top here you'll see the -- the purpose of a program in the design phase. And then there's -- here there's four performance criteria for what those -- whatever programs you're going to require, what those programs must achieve to provide that reasonable assurance.

So I'll go through design but I won't -- actually, I'll go through operations because that's the most interesting. So let's go down to operations, next slide. Actually one more, yeah.

So in operations, if the purpose of programs and operations is to provide reasonable assurance the plant is operated according to the license and regulations. So what are the performance criteria? Well, the plant has to stay within the license conditions for operations. The administrative controls provide reasonable assurance that human actions credited for protection of public health and safety will be performed when needed.

Humans relied on for our -- sorry. Humans relied upon are trained and capable of performing their assigned functions.

So within this we looked and we didn't put together Part 53 requirements, we just looked at what are the Part 50 programs that fall in and fulfill that area. So you've got technical specifications, training and re-qualification, operating plans, fire protection, radiation protection, emergency planning, security, and environmental protection.

Now, the degree that you need those will depend on your plant. Is it possible a particular design might be able to say well, for us we don't need a security plan because security's not an issue for us. Maybe, but as -- these are sort of the nominally expected programs for which we would expect to see

requirements.

On the far right are programs that are in this operational area where the NRC doesn't need approval, they don't need approval today and we don't think they need approval to review and approve it for Part 53. The effluent release program, worker safety program, OSHA programs, procedures for operations and emergencies, event reporting, none of those things need requirements or program areas.

So we do -- we do show here that there are administrative controls that are in the operations area that you are going to have at the plant, but they don't need to be required by the NRC, they don't need to be reviewed and approved by the NRC. That's the key distinction here. So I think that was -- no actually, one last slide.

So we've presented all that to the NRC. There's the date, September 15. We didn't get much response from the NRC at the meeting. They did say you can't compare Part 53 requirements with 50 and 52 requirements. As I mentioned before, an applicant is going to look at 50 and 52 versus 53 and choose the one that's most efficient.

And so if you've got twice as many operational programs in Part 53, it doesn't appear to

me that it's probably going to be more efficient.

The industry, this was their response, we don't understand that the NRC requirements are reducing regulatory burden. We'd like to be enlightened if that's the case, but it was -- it was true that it's not apparent to us.

And they said that well, the regulatory burden within each program is less, so we shouldn't really be concerned that there are more programs. I think their point was mainly based on there's fewer safety-related components, therefore the scope of SSCs to which the programs apply will be less.

Well, that may be true and certainly that's a goal, to reduce the amount of safety-related SSCs for advanced reactors. But just because the designer is being innovative to reduce the amount of safety-related SSCs that they need doesn't mean that the NRC should -- should double the number of programs which apply to those -- even when those -- especially when those programs aren't needed for a reasonable assurance of safety and duplicate or are redundant with other programs.

So with this, we're not sure -- the NRC has not yet provided a basis for requiring any of the programs. We do recognize that several of the

programs are going to need to be required.

We're not -- we're not disputing that programs will be required. It's just especially for those redundant programs and ones that don't have an equivalent in 50 and 52, we think the NRC has a burden of describing why those programs must be in Part 53.

With that, I'll end. And if you have any questions for me before we transition to Cyril.

MEMBER KIRCHNER: Could you go back to -- this is Walt Kirchner -- to quality assurance and design and construction phases.

MR. NICHOLS: Is it this one or the earlier slide?

MEMBER KIRCHNER: Yeah, I'm, yeah -- well, maybe this is for a rhetorical --

MR. NICHOLS: Slide 52 was QA requirements as well.

MEMBER KIRCHNER: Yeah. Is it basically your position that the equivalent of Appendix B would only apply to safety-related equipment structures and systems?

MR. NICHOLS: That's right. Yeah, we would assert that Appendix B should only apply to safety-related SSCs. It is -- I didn't mention this, but in Part 53 the NRC does extend many of the

Appendix B equivalent QA requirements to non-safety related special treatment requirements, which we commented would -- should not -- is not necessary and should not be done.

MEMBER KIRCHNER: Okay, thank you.

MR. NICHOLS: Cyril.

MR. DRAFFIN: Okay, the next topic is technology inclusive, and I'll cover that quickly so we can spend a little bit more time on goals for regulatory efficiency.

The key point here is that NRC has said they intend to revise the preliminary language to not restrict Part 53 to be only used for advanced reactors, and we agree with that intention. We think the Part 53 should allow all types of technologies and not have different rule frameworks for them.

We also think that it should apply to all developers and applications, including for electricity or process heat, hydrogen production. And it doesn't have to be necessarily limited in scope and could pick up utilization and production facilities covered under Sector 103, or even medical facility in RD in Section 104.

I won't go into the language for NEIMA, but I guess to cover just a couple points. NEIMA did

not limit the framework to only advanced reactors. And they provided other types of flexibility for applications.

And the second point would be, which is really the third bullet, the NRC does not need to come up with additional limits or definitions or screening criteria to handle additional inherent or passive safety features, because that's really going to create a moving target over time, which could disrupt regulatory stability.

So having other screening criteria is not necessary. And it seems that NRC is moving just to make it open to anybody who wants to choose Part 53 and then of course can meet these safety criteria in them.

I did want to use this visual. I think visuals are good. I think Marty did a great job yesterday of presenting some lucid figures for us to understand. This came out of a presentation to the NRC Commissioners on December 9, and it basically makes the point that Part 53 has a technology component that leads to requirements and new methods.

And you might a single technology for a prescriptive method and a prescribed method. On the other hand, if you have a flexible regulatory

environment maybe for any technology that's performance-based, and many methods, maybe not all methods, but many methods.

And what you see here is kind of a visual representation that NIA had, the Nuclear Innovation Alliance, on you know, what they thought of currently the Part 53, which shows it's pretty technology-inclusive, which we agree with. That it has requirements are kind of balanced between prescriptive and performance-based.

We like to see, as you've heard today, more performance-based, less prescriptive. But that the methods are over on the prescribed side. They, you know, not just for PRA but for other things and facility safety we just heard about.

And you know, the -- as they do the next iterations, moving over to something closer to a flexible regulatory framework would be recommended. And so I thought this was a helpful just kind of snapshot of looking at the characteristics of Part 53.

In looking at goals for regulatory efficiency, there's a number of different aspects we'll look at, maybe, you know, three to five. First two slides to adjust complexity.

We really think that for effective

licensing, NRC needs to have a high-level plan on how Part 53 will integrate all aspects of the regulations, including rules, guidance, staff interpretations and oversight. And you know, you were also looking for some high-level perspectives as well.

The second is on the guidance. To date it's been limited, other than, you know, TICAP, as we heard about this morning. And without guidance, it's really not possible to fully assess what they have in mind.

They provided a list of needed guidance and the nine-month delay offers time for them to prepare that.

And you've heard that the NEI and NRC are going to be working on some of those guidance components, which is important. Primarily associated with regulations, but it's also important to have clarity on how to have timely reviews of the process and to avoid submission of unnecessary information in the applications under Part 53, the process side.

And there's been limited clarity so far on the scope and extent of inspections during operations. So those are things to consider as we go forward.

And without clarity, you're going to have overlapping requirements in programs. We just

delineated the, you know, extra, you know, ten-plus programs that we just reviewed. But the more you have those overlapping programs and requirements, it makes it harder for staff to approve applications. And the goal is to focus on safety-significant parts of the technology and not be distracted by the kind of minor issues.

And also as you get a scale-up, if you -- if the vision of having multiple reactors and having nuclear make a big difference in the United States, and there's lot of reactor applications, the more you have -- the more you have simplicity, the better, and the more you have overlapping requirements and confusion, the worse.

So with that in mind, I wanted to spend a little time on what kind of internal goals for regulatory efficiency might be considered. With the potential order of magnitude increase in applications, NRC needs to be -- needs metrics to judge their internal regulatory efficiency. There have -- made some steps, they've talked about it, but more is needed, particularly in terms of metrics.

So for instance, we need shorter and predictable timeframes, you know, how many months. And it's not just establishing the number of months in

a predictable manner, but can you shorten the schedules while still ensuring that the NRC conducts a thorough safety environmental review.

For instance, for the commercial non-power reactors and medical isotopes, the space is, you know, 18-24 months. And especially as you have smaller sizes of these advanced reactor facilities, they also should be able to have a time schedule like that. And that has been achieved by the SHINE facility in Wisconsin.

So the NRC can do it, and, but for the smaller sizes, you know, a schedule that's much shorter has merit. And the current estimate of, you know, maybe three years for the construction permit, another three years for an operating license until you get a safety evaluation report, and then there's some administrative activity. So if it's six to seven years, that's a long time for these reactors that can be done we think a lot faster, and that'd be useful.

Second topic is topical reports, how to use them, how to effectively utilize them. Also how NRC's going to consider documentation done by, let's say the Canadians or the UK regulatory authorities. Using that effectively for different applications is valuable.

On lessons learned, you know, there's some activities underway for 50/52, but we have experience. And it was, you know, NuScale, for instance put in a letter on February 19 with five recommendations of how things could be done, and NRC was going to get back to us in a stakeholders' meeting, but every month they've kind of delayed it another month. So you know, we want to understand how NRC is considering the lessons learned that NuScale and others have had and incorporate that.

Regarding the RAIs, some groups have suggested you might be able to get it down to two cycles, and we certainly don't want the number of RAIs required for, let's say the NuScale application, which was very large. So how can you reduce the requests for additional information, and especially for non-safety significant matters?

So there ought to be some metrics there that the NRC could develop for themselves about how to have an efficient process and how to review that. Now, of course, you want to have an effective, high quality applications from the designers, but it's a two-way street, and we want to make this a more efficient process.

The pre-applications reviews has been

talked about as being beneficial.

MEMBER BLEY: Well, can I interrupt you there?

MR. DRAFFIN: Of course, of course.

MEMBER BLEY: What are you folks doing to make sure that the applications that come in will have addressed the potential technical issues that, you know, in itself would reduce the number of RAIs substantially?

MR. DRAFFIN: Well, I think each developer has that responsibility, but you want to look at what are the questions that NRC has asked before. What kind of -- what kind of history has there been for anything like their reactors.

There's probably a recognition on the applicant's part that they probably understand the technology better than the people reviewing it. So it's the applicant's responsibility to explain the piece part, to show the logic, and not just assume it's good just because they submitted it.

And so thinking through how they can explain it, thinking through the questions the NRC have asked, and prepare that, I think the -- is the responsibility applicants have. We have a -- NIC has not a, you know, a training program to do that, if

that's -- but it is a part of the teamwork effort.

MEMBER BLEY: Okay, well, if you do, that'd be really interesting to see how you're doing it, because, you know, if we looked at the -- at the history of life extension efforts, we went from applications that -- well, the industry itself trained itself on how to submit applications that have many fewer questions, and that was very helpful.

MR. DRAFFIN: At the American Nuclear Society meeting about a week ago or so in Washington, there was a number of the CEOs of the various companies were together. And one of the points that they made was limit the size of what you're submitting. You know, the applications should be limited in terms of number of pages, you know, 500 not 10,000.

And then have background material that's available for staff review and point them to that direction. And so that's a little bit of focus on what's really the most important aspects that are really most important to safety and hone in on them. So that was one of the messages that a couple of the CEOs made.

MEMBER REMPE: Well, along those lines, I have seen a reduction in scope in pre-application

topical reports where they are doing things in smaller pieces where it's an approach to methodology instead of the methodology with the validation data that you'd see with light water reactor topical report submittals.

And so it -- I mean, I guess the good side if you're a design developer is you can say I have ten approved SERs from the staff. But what the progress is toward getting to final license is a lot smaller with those ten approved SERs.

And is there any effort by your organization to try and, or at least to recognize that that's going to cost more with respect to schedule and you know the staffing resources are limited? Has that come up at all in your discussions?

MR. DRAFFIN: We've had discussions. Some of the material, you know, they consider somewhat confidential and don't want to share just yet when they're going through NRC processes.

The -- there has been some frustration with the pre-application process because they may have discussions and then the staff varies and there's -- it's not as -- and then at the very end they don't clarity on it's going to be lasting. They may have a different set of reviewers who are going to review the

application after they've spent, you know, a number of, in some cases years on the pre-application.

And so the pre-application process has some issues in terms of what kind of benefit they get out of it relative to the costs. And so there's a tradeoff between -- the advantage of the topical report is you get some clarity to it, some definition that is lasting in contrast to a pre-app.

So I think there's a balance there, and that could be one of the reasons why a couple have chosen to do smaller topical reports rather than relying just on pre-applications, which is not as definitive. Over time I think you may find some bigger ones, but I think in some ways that's a licensing strategy each company has. But I think we're -- I think we're comparing notes, but I --

MEMBER REMPE: Yeah, I mean, we've having -- everyone acknowledges in this example, and I'm guessing we'll see more of them. Still, one topical report review, you're going to at least have two, maybe more. And anyway, that's just a concern I have when you -- because ultimately it'll come back that the NRC schedule of cost was so much but it's because of the process they've chosen.

MR. DRAFFIN: It's a combination of the

process the applicant's chosen and how quickly NRC responds and how definitive their analysis is. And some people have said that NRC staff is -- in pre-application will listen carefully, but they don't say as much. They don't give clarity in terms of what to do, and that can be frustrating too.

So I think it's an issue for both sides to become more efficient.

MEMBER REMPE: But it's important for both sides to recognize that something is a bit different here.

MR. DRAFFIN: Agreed.

MEMBER HALNON: So I -- this is Greg, I'm kind of confused. Are you looking for the Part 53 rule language to correct these problems or issues that you have? It just seems premature to be talking about them when Part 53's not even established yet.

MR. DRAFFIN: No, we're not asking it in the rule, we're just saying that for the rule to be used and useful, I mean, this is some ways a competition between 50 and 52. You need to think through the entire plan from the regulations to the implementation and the -- and the application.

So thinking through these issues would not be in the rule, but it's something that people should

be mindful of in terms of the process they use in the application to make it a better outcome for all.

MEMBER HALNON: Okay, because I just heard that during the operational programs that the NRC does not need to approve licensing controls related to compliance, and I think these are good bullets, but I'm not sure that you're in a position to tell the NRC how to review a topical report. Especially if the topical report quality is not where it needs to be or any other kind of pre-app process.

So anyway, they're good bullets, but I'm not sure why we're spending time on them.

MR. DRAFFIN: We're encouraging NRC, and perhaps if you have comments on it, to come with metrics through this, to come up with ways of really judging this. Because I think these are important topics, and I'm not going to go through each one individually, but --

MEMBER KIRCHNER: Cyril, this is Walt. I would say it's a two-way street. And unfortunately because of the competitiveness and the proprietary nature of each of your members' concepts, it's probably hard to collaborate as well as the industry with license renewals and subsequent license renewals in terms of lessons learned and of making the process

more efficient.

I guess the first thing, though, I wanted to mildly object to is your rather blanket statement that the length of the review is going to scale with the power. That, if we take aside for the moment micro-reactors, which are more in the category of test and research reactors, that's -- that's not a necessarily proven or even wise conclusion to draw.

A first-of-a-kind reactor with a novel technology without an extensive operational database, without any reliability or minimal reliability kind of numbers to feed to a PRA, I can go on and on. It doesn't -- I think it's -- I think it would be a mistake to assume that should -- that the review should be shorter just because it's a smaller reactor.

A lot of these designs are going back to technologies that were tried decades ago and with cause were dismissed. Now, we can say well, we have new innovative ways of looking at these particular technologies and etc., we have better computer codes, all that.

But I wouldn't jump to the conclusion that a 100-megawatt reactor should have a shorter review than an LWR, a large LWR. I think that would be a mistake. And it depends on the maturing of the

technology, the amount of prototypical experience that is out there than can be drawn upon.

It depends on what coolant you're using. If it's a liquid-fueled reactor you've got much more complicated reactivity, insertion accident concerns. I could go on and on.

But it doesn't -- I think it would be wrong to assume that just because it's a smaller reactor -- and I'm talking about reactors now of size that would have an impact on climate change. I'm not talking about micro-reactors. And those, I think that's -- that's not a substantiated conclusion that a new concept should have a shorter review period.

And then I think maybe Dennis was going way. I mean, a lot of this is going to depend on the quality and maturity of the application and the material to back it up. But I do think you could look at the experience of several of your, I think they're your members or however you refer to them.

And probably look at what the sticking points were in the pre-application interactions with the NRC. And then probably draw from that at least, as you say here, key policy issues. I won't -- I won't call them policy issues, I'll call them design issues, sticking points, where the sticking points may

be. Like on source term definition, quality assurance, general design criteria, etc.

I think there's work that you could do on your side based on recent experience to improve that interaction and engagement with the staff and not just hang it all on their shoulders. That's probably enough, I think you get my drift.

MR. DRAFFIN: I do, and I agree with both points. I wasn't implying that, you know, 200 and larger reactors, particularly for the first of a kind, hopefully they'll be more efficient in future applications. I was thinking more in terms of differentiation. The example I gave would be the smaller sizes, the heat pipes, the micro-reactors, where it should have a different timing.

And on your second point, yes, I -- sharing those lessons learned not at the end of the process but during the process is -- would be valuable.

MEMBER KIRCHNER: Thanks, thank you.

MR. DRAFFIN: Sure. So I think we've covered enough, you can read the rest. I'd just point out at the bottom that NEI a couple days ago put out a report on promoting efficient NRC licensing reviews that might be of interest to you, and they had a

number of recommendations.

For -- we are encouraging that --

MEMBER BLEY: Can I just ask our senior scientist, Derek, are we aware of that, do we have that document Cyril just pointed to?

MR. WIDMAYER: No, but I'll get it. I don't have it yet.

MEMBER BLEY: Okay, thanks.

MEMBER REMPE: I think what's on the slide is correct, and some of us received a copy of it. I think what you said was NEI, but I believe what's on the slide --

MR. DRAFFIN: NIA.

MEMBER REMPE: Yes. And we do have a copy of it that I got, but I'm not sure how widely it got distributed.

MR. DRAFFIN: Good. It was helpful. And it has some specifics and some details on a number of different cases. So this was the nuclear. Okay. And so it's worth your attention. The clear vision -- and you can just go to the NEI website, and you'll find it pretty quickly from there.

So we need to look at a clear vision and specific goals. You talked about that yesterday. We agree with that, you know, systemic approach.

Back in July, industry has five utilities, seven developers, a couple trade associations. All came up with a unified industry position that it's available for all technologies and risk-informed licensing, that it's less burdensome over the lifecycle. And again, we're stressing the lifecycle. And it has clear and objective acceptance criteria, how much is enough in terms of the review.

It's important because, you know, we do hope that there will be escalating deployments of light reactors and SMRs in the 20s and 40s for addressing the clean energy sources in our country and around the world.

So hopefully, there will be a number of these applications. And so you want to have a vision for that. And you also want to have an efficient process to how you can handle that both from the industry and from the NRC.

Just to point out that we've been providing input to the staff for a long time. Over two and a half years ago we provided, you know, details on what should be considered principles focused on technical requirements and administrative requirements, eliminating, streamlining requirements that are overly prescriptive or not relevant,

simplicity in the final safety analysis with the right-size FSAR to reflect safety significance.

A fixed time period, once you've gotten the initial reactors approved, because as we've talked about, the first one is going to take longer as the staff thinks through it, but once you've gotten through the first one, how can you replicate that quickly, how can you keep the core teams in place.

So I just mention this as something that, you know, we've been engaged with for a year plus.

Path for exemptions, clearly we want, and everybody thinks there are going to be fewer exemptions in Part 53 for the non-light water reactors versus 50/52. But we still need a smooth process for Part 53 exemptions.

It was raised at the last Commissioner's meeting on December 9th that there's going to be many applications, and the NRC could make the process easier in Part 53 and maybe proactively recommend exemptions, because even as mentioned yesterday, there may be exemptions in 53. And you might as well make that as smooth as possible for all parties.

And coordination with other rulemakings, they're underway for emergency planning, security, GEIS, environmental reviews, Part 50/53 lessons, 52

lessons learned, and so to try to integrate those along with siting and deal with the upgrades and updates over time.

You know, we talked about it yesterday. And I just reemphasize that that's important to do. And I won't go into some of the details for lack of time. But we'll just, we'll stop there.

I thought it would be interesting to at least try to discuss there's a diversity of opinion among ACRS members and among the industry, but on a couple areas where we think there's similarities to the way ACRS and the industry has approached 53. And obviously, you might have comments or additional items that you want to add.

The first one is dropping the two tier structure. We both recommended that. And that has happened.

We like I think the flow of objectives and the safety criteria and safety functions. That's a good logic. And overarching design principles in one place is good. We would encourage the decoupling between the, from the first iteration, normal operations. And I think this has been done.

The next one's really, we kind of touched upon this morning and, by Marc, that, you know, we all

want to not rely just upon the LMP approach. You're open to considering other ones. It could be 53. It could be methodology neutral and if the PRA language could be modified to enable PRA in ways an applicant expects to use the tool. It's a tool. It's a very useful tool.

And that there's a spectrum of how applicants use between risk-based and deterministic, and that 53 shouldn't be risk-informed. And you want flexibility and a PRA graded approach.

The last one is a broad interpretation of credible events. They're standards. We've talked about and you've talked about in previous meetings there ought to be boundaries, you know, how far is enough in terms of the evaluation for what's credible.

The next slide and the last of this is the -- I think we both agree you need to add requirements for safe, stable end conditions, end state conditions, that unifying QA requirements rather than just scattering about Part 53 is beneficial, that a coherent and detailed explanation of the integrated intent of the rule is important.

There may be some duplication in the language. More guidance is needed to clarify regulations. We both, you've obviously have heard

we've questioned whether ALARA should be in the rule.

We also think it's important to have flexibility to address the broad range of technologies. I think there's agreement there.

And I think there's agreement that you need a systemic search for hazards, initiating events, and accident scenarios.

So I just mention this as, you know, potential areas where I've -- and just in listening to the conversations, there seems to be agreement.

If you have, and I'll pause in case anybody has a question or wants to add more.

Two other topics, one is QA. The simple point is that we want to have it in one location. It gives a chance to have a fresh look of how you, alternatives to NQA-1, ways of using commercial components, add quality programs, use of broad standards, the ISO 9000 series.

We want to make sure there's a strong supply chain base that can, both domestically and internationally. And approval of more universally recognized standards outside of NQA-1 I think is beneficial.

And I think the NRC has mentioned this. They've evaluated this and planned and have, you know,

have language to support this and heading in this direction. So I think that's good.

Also NEI is developing guidance on using ISO-9001 to meet the Appendix B QA standards, which will be available to operating fleets, new reactors license under 50/52 and for 53, assuming that the 53 QA requirements are consistent with Appendix B. So I just wanted to mention QA.

And then the last slide for the day, and there were some backup slides, is to just reiterate that we provided our letter back in November to provide clarity and detail on the perspectives provided to the NRC meetings and letters over the year, especially in areas where NRC has not addressed our concerns or described why they aren't addressing our concerns.

Attachment A has 22 pages of comments by specific topical areas and addresses the positive and the challenges. Some of those are, most of those have been presented before to the NRC staff, but it's kind of providing them in one spot and augmenting a bit.

Attachment B has detailed comments on nearly all the preliminary Part 53 rule. It's regulation by regulation. There's specific proposed revisions, some of which Marc referred to today. So

it's an opportunity for you to read it in more detail and for the NRC staff to consider them.

We had, both NEI about a year and the U.S. Nuclear Industry Council had offered suggestions for language changes on Subpart B, for instance, back in the February timeframe. We got no response in any of the public meetings.

So at least we wanted to get this on record because we think it is important, and whether (audio interference) today it's an opportunity for the NRC to, staff to consider these and perhaps make the changes that make sense. And if the ACRS sees benefit in some of them, they may, you may want to consider that, making statements in that regard.

Finally, on the, as you see, it's just a wrap-up of here's the 40 submissions we've made since, in the last couple years.

MEMBER BLEY: So just a comment, individual member comment. I read the letter. And I read the attachments. When I read the cover letter, it was like Part 53 is a piece of crap, there's so much wrong with it, it's -- you almost thought it was irretrievable.

Then I go and I read the comments, and I get a really different flavor. You guys provided

specific word changes and the like. And I think the same thing happened in the Commission briefing, which I listened in to.

I left the Commission briefing thinking that a lot of this was communication, that there wasn't intent by the staff, but you read intent into it, or at least the words meant something different to you. I think this is part of the iterative process.

I just worry that inflammatory cover letters may not be helpful in the latter process. But that's just my personal comment.

MR. DRAFFIN: A couple reactions. One is the details, we tried to be thorough in terms of being professional and focused in our attachments. So hopefully they stand alone as being helpful and clear.

In terms of the letter, I think there is some frustration. I think there's a belief that Part 50 and Part 52 can work with exemptions for non-light water advanced reactors and is working, and that the purpose of Part 53 was to make the process more efficient, not to add regulatory burden and if Part 53 is not, not really needed unless it's really better.

And so I think one of the aspects of the, that's reflected in the letter and maybe some of the statements that you might, you know, some people might

interpret as inflammatory is, look, to really point out that what we've seen may not be used and, therefore, take some of our comments seriously and, you know, not, and see what makes sense, because you really do want Part 53 to be, you know, better and more efficient or it won't be used.

And so I think that probably causes people to be, what some people would say, well, forthright and other people might use other words. So --

MEMBER BLEY: And again, I just want to make it clear the Committee I think agrees with the objectives you guys have. We want something that's efficient and useful. And, you know, that's why we had you guys come for the whole afternoon to hear your comments, you know, in a condensed form. So I appreciate that.

MR. DRAFFIN: And we appreciate the time.

CHAIR PETTI: Ron, you got a question.

MEMBER BALLINGER: Yeah, I have. One person's opinion, I, too, read the letters, both the September one and the November 5th one. And I tried to follow the string through the issues related to the QHOs. And I thought I had, but then I realized that I haven't.

And there was a great philosopher, Don

Henley. He once said there's three sides to every story, yours, mine, and the cold, hard truth.

And after listening to today's presentations about the issues related to the QHO and the admonition that the staff had basically said, sorry, we're not going to address your comments in the QHOs, I'd like to hear a response from the staff to the individual comments that were made today related to the issues with the QHOs.

You know, again, I'm just a metallurgist, just so I'm a little obtuse sometimes. But I just couldn't follow it. And today's presentation piqued my interest a lot.

CHAIR PETTI: Bill, want to try that?

(Simultaneous speaking.)

MR. RECKLEY: I think that's a two-hour discussion --

CHAIR PETTI: Oh, okay, okay.

MR. RECKLEY: And we will --

MEMBER BALLINGER: I agree.

MR. RECKLEY: We will be --

PARTICIPANT: It's a big time discussion.

CHAIR PETTI: Okay.

MR. RECKLEY: Yeah, and we will be back as we go through the sections and, as we mentioned, the

statements of consideration where we lay out our logic.

Again, from our point of view, if you're going to have a performance based approach, you need metrics. You need something that you can come back and compare it to. And we thought, as we started this, that one thing that we adopted early on was we weren't going to try to invent new things.

And so when we looked at what metrics were available for risk-informed approaches, the QHOs were a logical place to start. So they've been in use now for 30 years and have been used in a variety of applications. The staff routinely uses them in terms of performing regulatory analyses and so forth. So we just, again, we thought it was a logical place to start.

I understand the thought that you might be able to use qualitative kind of measures. What we have said previously is our fear for qualitative measures is you give up predictability because the measures themselves are qualitative. So that's all I would offer. And then as we come to you next year, we'll provide a different rationale.

But you gave me a chance here. So I do want to say while I have the mic that I would just

suggest that the members, when you, or if you're going to be thinking about ALARA, you know, we have in the past and continue to take issue that considering ALARA in the design stage is new.

I would point the Committee members to 10 CFR 50.34(a) and have you read it. And then you can look at the associated regulatory guides like Regulatory Guide 1.109 and Regulatory Guide 8.8 that all go to considering ALARA at the design stage. And as some of you have brought up, it makes sense to do it at the design stage.

And again, given -- just another correction I would like to offer is on the design basis discussion and that including design basis events into the design basis of the facility, I know the terminology is awkward, but that that is a new concept.

I would refer the Committee back to Regulatory Guide 1.86, which endorsed NEI 97-04, which has specific discussions about how design basis events such as ATWS and station blackout are incorporated into the, quote, design basis, the 50.2 definition, into the plants.

And so some of this, whether it be misunderstanding or whatever, I'm not, it's, I'm a

little baffled sometimes when these things are called new requirements when they've been around for -- ALARA's been around since the creation of the Nuclear Regulatory Commission. And design basis goes all the way back to the mid-'90s and how it's incorporated into the design basis.

So anyway, but you asked about QHOs, and I went off on a tangent. So --

MEMBER BALLINGER: Yeah, let me circle back to those, well, you know, to use a term, let me circle back on that, the QHOs.

I mean, it sounded to me like there are unintended consequences that need to be at least looked at and discussed. And so I think that the back and forth today on QHOs was a very valuable discussion.

But I think we need to get, I personally would like to get some closure on this where we can look at the staff's part of the story, if you will, maybe not response.

MR. RECKLEY: Okay. Well, and we will do that. And given the primary or a primary concern ended up being a legal concern more than a technical one, we'll also talk to our Office of General Counsel about those implications.

MEMBER DIMITRIJEVIC: And I would like just to make a small correction to something you said. You said that this industry was using those QHOs for, you know, like say from '80, so that would be forty years.

I actually beg to differ. I don't think those -- those QHOs were set as the basis for the risk metrics in safety goals. And those were used for forty years, that correspondence within those.

So I don't want to say the plants were reviewed based on the, what would we say, like the individual risk of latent times in (phonetic) facility is 2 to E minus 6 plant -- for plant life. They were reviewed based on core damage frequency less than 10 to minus 4 per year. And correspondence within those two numbers nobody ever considered in this forty years.

So I think that's true what I'm saying, and I will stand behind that. So we cannot really say that this industry was regulated based on those QHOs for forty years. That's not in my opinion true, sir.

MEMBER KIRCHNER: If you go back and look at the safety policy, the Commission at the time it was revised and then issued, what, circa '88 or so, the actual quantitative numbers were described as

aiming points but not as regulatory criteria.

So maybe, Dave, it might be beneficial to revisit this discussion where the participants have a little more time, including ourselves, to prepare for --

CHAIR PETTI: Yeah, yeah, no, I agree. I think this is just sort of on our tickler list for when we meet again or the time after that or whatever.

But I think we should, you know, just have some time in one of our subcommittee meetings, you know, response to NEI concerns, NEI and NIC.

MEMBER KIRCHNER: And I might make another observation. I'm not a lawyer. But since it was suggested by NEI that if these QHOs are used as proposed they would be subject to legal contention in a hearing, I would suggest that then the actual quantitative QHOs as well might be subject to a legal contention.

And that may open a Pandora's box that -- it's just an observation I make. As long as they're goals, they're currently, they are policy, it's in the policy statement and it's a goal, which is much different than being a requirement.

MEMBER BLEY: Yeah, it never was a requirement. But, you know, the history of how we got

to the way it was worded is interesting. We can go into it sometime.

Dave, I think this is a time we go around the table. And if that's so, I'd make a couple summary statements.

CHAIR PETTI: Yeah, I think so. Go ahead.

MEMBER BLEY: You know, yesterday and this morning I learned an awful lot, and I was very pleased by a lot of what I learned. This afternoon I got a lot of information.

My reading of a lot of it was the staff and the industry are pretty darn close together on a lot of things. There's kind of a catalog of specific, I don't know, if misunderstandings, places people are reading the same thing differently that kind of get piled on.

One thing that was brought up I thought interesting and I want to say something about and that was the presentation about programs. And the part of it I liked. You know, parts of it I didn't like so much because it kind of looked like we were arguing to have the old ad hoc approach that got us to where we are enshrined.

But the idea of a structured organizational overview of programs and how you pick

them and what they should be seems something that fits very well within the staff's overall structure that all of us I think liked for Part 53.

And having that kind of structure would help us all understand the programs and why they're here and whether they should be here better.

And I don't know if that, that probably doesn't go in the rule language. But this document we've all been hoping to get our hands on that tells us how all this fits together would be a good place to explain that.

Anyway, some of these things are worth further delving into, because I think on QHOs there's, it would be interesting to hear from the staff again and a little more clarity on some of the pieces, because I think there are things we all interpret a little differently that need to get aired out before we're all done with this. But now we have a little bit more time to think it through.

Anyway, sorry for the long ramble. But I was kind of pleased by the overall result of today and yesterday.

CHAIR PETTI: Yeah, it's been information dense but also very, very valuable I think. Anybody else comments?

MEMBER HALNON: Yeah, Dave, this is Greg. You mentioned dense. And sometimes I feel that way with all this information.

But first I wanted to compliment the industry and U.S. NIC. I think that they've put a lot of thought, a lot of work into their comments.

And I think we need to really look at, hard at the implementers who have to do a lot of work before it even gets to the table of the NRC to review.

And I think that's part of the issue here is that the designers who need to have criteria to design against has to be, I've mentioned this before, a bright line so that they can do their calculations, do their design, do their plant layouts so that they know that they're providing the NRC, one, a quality product but, two, one that meets the regulatory requirements.

So I think that I'll go through that 83 page of comments and look at them. But I would really encourage the NRC staff to look at the comments and assure that the goals are being met by the regulatory language but also keep the implementers in mind, because the quality of the product to get to review is going to be directly related to how clear the designers are to meet criteria that you want.

So I'm not sure that was real clear. But I think what I'm trying to say is that to meet the NRC goals of adequate protection, the implementer's language, if it does meet that goal, then we really should look hard at those comments.

So, again, I was very pleased with the last couple days. I learned a lot. Unfortunately, I don't think it's going to sink in as much as it needs to. But I got a lot of reading to do. So we'll go from here. Thanks.

MEMBER BLEY: Hey, Dave, one thing I didn't say that you might have wanted us to talk about, I don't think we're at a point for a letter again.

CHAIR PETTI: Oh, correct, no, I agree with you. Yep. Vicki, your hand is up.

MEMBER BIER: Yeah, thanks. I wanted to just come back to sort of a rambling point I made before about leading role or confirmatory role for PRA.

Given that all of our past experiences really PRA on a confirmatory role, I'm very sympathetic to the idea that the regulatory framework at least should not prevent that. There may be advantages to using PRA even earlier in the process.

But I worry a little that a very early PRA that's kind of more coarse or, you know, simplified assumptions without all of the detail may sort of just get passed along and ratified at later stages.

So once you have the detailed design and then the site-specific and whatever, are people really going to take as thorough a look at it if they're starting with an existing PRA that already got through an NRC approval process rather than if they're starting, you know, de novo from scratch, blank piece of paper, what do we think the risks are here and how can we quantify them?

So I just wanted to say, first of all, I had a lot more doubts and skepticism yesterday. And I really liked Marty's presentation. A lot of my doubts and questions I think were resolved through his comments.

But that's one of the ones that kind of lingers is I like the industry proposal of at least allowing confirmatory use.

CHAIR PETTI: Okay. Thanks. Charlie?

MEMBER BROWN: Yeah, a somewhat different flavor on the observation, the industry made several comments and the staff did also.

Obviously, what we're trying to achieve in

all this is to achieve a more efficient form of a regulation in order to get, reduce the time it takes to get through these design developments and get on into really building some plants.

And one of the things I didn't hear or maybe I missed it was, at least what I observed, I've been through four -- and Dennis was here for these also. I don't know that he would echo me. But we've been through four new applications from 2008 until now.

And I can only give my perception of the general areas which I was most detailed involved in was that we achieved a lot of efficiency and quick responses and completion because the applicants submitted a far higher quality technical documents which we got to review that didn't have to have a lot of handwringing on them.

And I think a lot of the efficiency has to be if you get a good detailed design submitted with well documented it will go much more rapidly.

The fear I have is that part of Part 53, do we add too much back in or, you know, and the industry is making an argument that we have, or the other aspect is are we taking stuff out that still should be in there. So it's a balance all the way

along the line.

But I think the quality of the application and the detail design information that's provided for their systems is a key element in getting them done quickly and efficiently. So that's just an observation on my part based on 12, 13 years' worth of reviews.

CHAIR PETTI: Okay. Other members' comments?

MEMBER DIMITRIJEVIC: Yeah, I just would like to add that those were excellent meetings. And actually I think that this is, myself I made some, you know, qualitative jump of the understanding how the things, you know, will fit. And then so, and the presentations were very, very good. So thank you for that. At least I am now confused on a much higher levels. So --

CHAIR PETTI: Well, I know when we had set up the agenda, Derek and I, I mean, I was very excited about it because I really thought it was going to be good. And I'm glad that members see that. Walt.

MEMBER KIRCHNER: Yeah, just, Dave, thanks to all the presenters. I thought these two days were very useful and informative.

And just one observation that, just off

the top of my head, looking for ways for both the industry and the applicants to be more effective as measured probably in cutting down the number of RAIs and time lost in dealing with those.

The work that's being done for RCAP, I think it's Appendix D, which will address, you know, essentially looking at 50 and 52 and sorting through what requirements would be applicable and not may be a very useful thing for both the staff and the applicants, potential applicants who are coming in with non-LWR designs.

But it doesn't work well if the applicants come in and just say, well, all this stuff doesn't apply to me because I've got a better design and, therefore -- I'm exaggerating, of course.

But getting to quick resolution on things like general design or principle design criteria or functional design criteria, whatever they're called, source term and quality assurance and matters like that, I think will make that, those initial interactions between applicant and staff much more productive and perhaps cut down on the number of RAIs.

So I think there are ways that both sides could make improvements. But I thought that RCAP, I think it's Appendix D, will be a very useful document.

And thank you to all the presenters.

CHAIR PETTI: Okay. Anyone else? Okay. Then let's do one final ask. If there's any members of the public that have a comment, they can unmute themselves, star 6, tell us who you are, and give us your comment. I don't hear anything, but I see Marc's hand up. Yep.

MR. NICHOLS: Yeah, thanks. I just wanted to offer a clarification. I know the NRC said ALARA is already in the design for Part 50. And they pointed to 50.34(a).

If you actually go look at that, it's not ALARA for the entire design of the plant. It's very specific what it applies to. And specifically what it applies to is the equipment in high radiation areas.

And so, you know, if that carried through to Part 53, you know, I don't see any issues to that. But it's very specific in what it does. It's not the way that Part 53 would apply, hey, here is ALARA you have to apply to the entire design. So I did want to provide that clarity.

CHAIR PETTI: Okay. Well, with that, I want to wish everyone happy holidays. And we'll see folks in the January subcommittee week. And with that, I guess we are adjourned. Thank you all.

(Whereupon, the above-entitled matter went off the record at 5:36 p.m.)

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Advisory Committee on Reactor Safeguards (ACRS)
Future Plant Designs Subcommittee

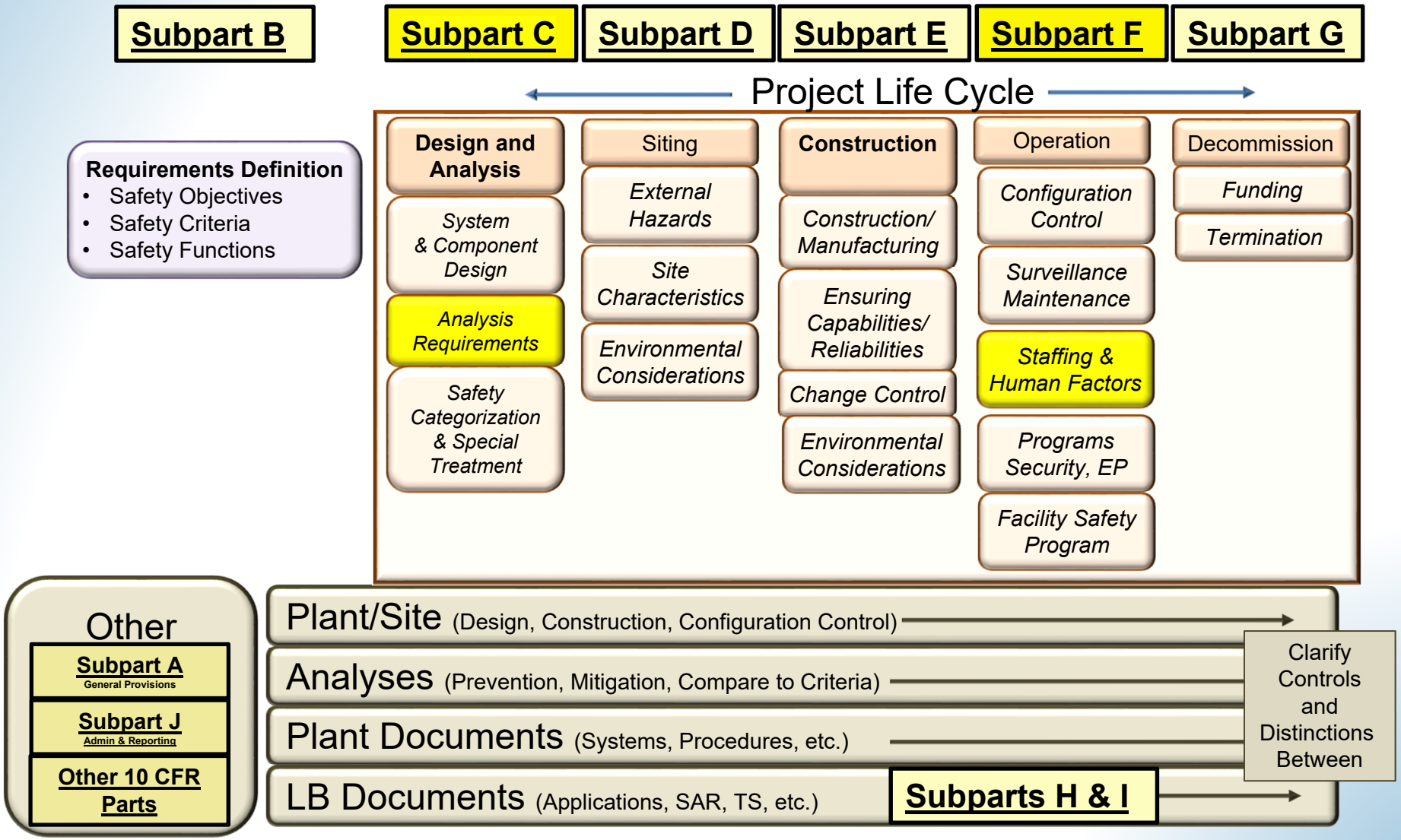
10 CFR Part 53
"Licensing and Regulation of Advanced Nuclear Reactors"

December 16-17, 2021

December 16th Agenda

9:30am – 9:40am	Opening Remarks & Staff Introductions
9:40am – 10:00am	Update on Part 53 Rulemaking Schedule
10:00am – 1:00pm	Graded PRA and Possible Licensing Pathways
1:00pm – 2:00pm	Lunch Break
2:00pm – 5:00pm	Staffing, Operator Certification, Simulators [Subpart F - Requirements for Operations]
5:00pm – 5:30pm	Discussion

NRC Staff Plan to Develop Part 53



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Current Status

Subpart	Subpart Description	Status
A	General Requirements	Released **1st** iteration, including initial definitions (April 2021)
B	Safety Criteria	Released **3rd** iteration (August 2021)
C	Design and Analysis	Released **3rd** iteration (August 2021)
D	Siting	Released **1st** iteration (April 2021)
E	Construction	Released **1st** iteration (April 2021)
	Manufacturing	Released **1st** iteration (April 2021)
F	SSCs	Released **1st** iteration (April 2021)
	Personnel	Released **1st** iteration (October 2021)
	Programs	Released **1st** iteration (April 2021)
G	Decommissioning	Under development (Planned release **December 2021**)
H	Licensing (LWA, ESP, SDA, DC)	Released **1st** iteration (August 2021)
	Licensing (ML, CP/OL, COL)	Released **1st** iteration (October 2021)
I	Maintaining Licensing Basis	Released **1st** iteration (August 2021)
J	Reporting & Financial	Released **1st** iteration (August 2021)
Part 5X	Deterministic Alternative	Released **1st** iteration (October 2021)
Part 73	Physical Security	Released **2nd** iteration (November 2021)
	Cyber Security	Released **2nd** iteration (November 2021)
	Access Authorization	Released **2nd** iteration (November 2021)
Part 26	Fitness-for-duty	Under development (Planned release **December 2021**)
Other	Technology-Inclusive, Risk-Informed Maximum Accident Approach	Under development
	Conforming Changes	Under development
	Statements of Consideration	Under development
	Regulatory Analysis	Under development

Revised Part 53 Rulemaking Schedule

Key Rulemaking Milestones	Activity Date(s)
Public Outreach & Generation of Proposed Rule Package	July 2020 to August 2022
• *NGO Public Meeting*	*February 2022*
Submit Draft Proposed Rule to Commission	February 2023
Commission Review	March 2023 to May 2023
OMB and OFR Processing	May 2023
Publish Proposed Rule	**June 2023**
Public Outreach & Generation of Final Rule Package	June 2023 to May 2024
Submit Draft Final Rule to Commission	December 2024
Commission Review	January 2025 to April 2025
OMB and OFR Processing	April 2025 to June 2025
Publish Final Rule	**July 2025**

Other Key Milestones & Activities

- Continuation of topical public meetings, as needed.
- Continuation of frequent ACRS meetings
  - Focus of the meetings will be topics ACRS members want to discuss in more detail
- Continuing to publicly release preliminary proposed rule text
  - In January 2022, the staff will release a section of the preliminary FRN with all of the Part 53 subparts in one document

Coordination with Other Rulemakings

- Emergency Planning for Small Modular Reactors (SMRs) and Other New Technologies (ONTs)
- Limited Scope Physical Security
- Decommissioning
- Part 50-52 Lessons Learned
  - Severe Accidents (add to Part 50)
  - Probabilistic Risk Assessments (PRAs) (add to Part 50)
  - Three Mile Island (TMI) Requirements (add to Part 50)
  - Fire Protection Requirements (align Parts 50 and 52)
  - Operating Licensing (revise simulation, walkthrough requirements)
  - Licensing Processes (eliminate need to renew design certifications (DCs) and standard design approvals (SDAs))
  - Environmental (allow reference to DC environmental assessment)

Graded PRA and Possible Licensing Pathways

Marty Stutzke
Division of Advanced Reactors and Non-Power and Utilization Facilities
Office of Nuclear Reactor Regulation

December 16, 2021

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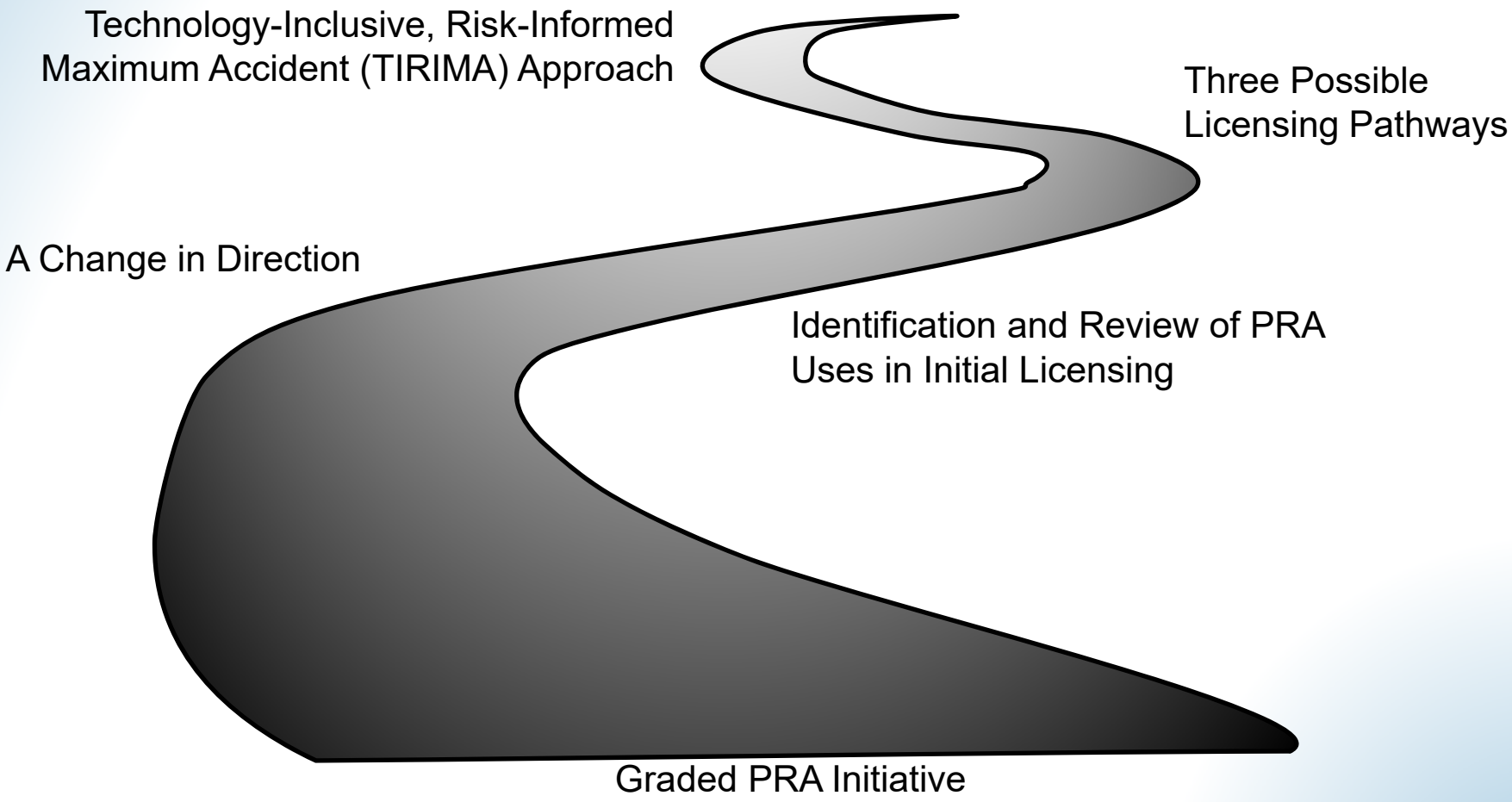
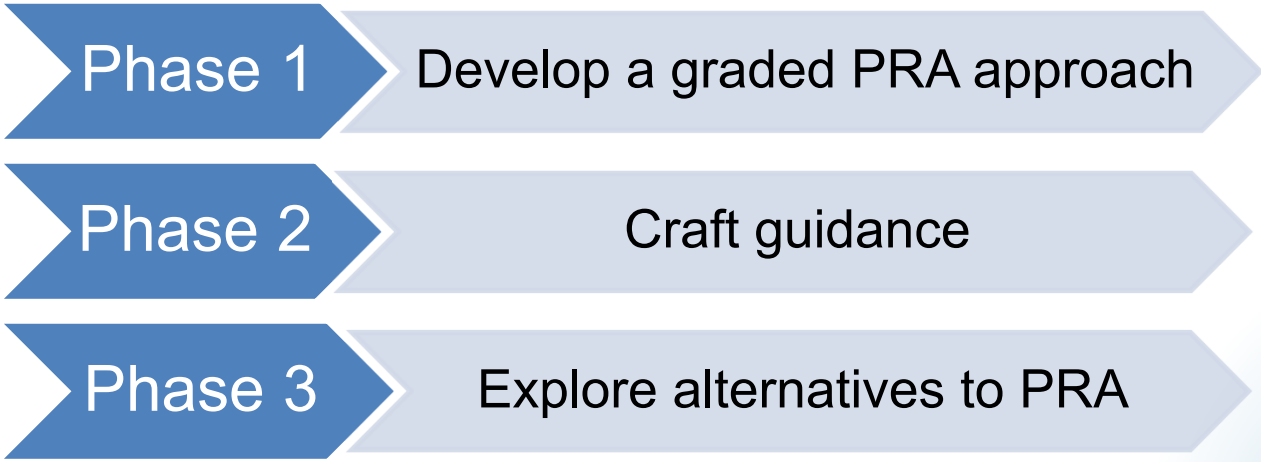
Overview



Graded PRA Working Group

- In the spring of 2021, a working group was formed to develop viable options to “grade” (“right-size” or “customize”) the PRA developed to support initial license applications (construction permits (CPs), operating licenses (OLs), DCs, SDAs, manufacturing licenses (MLs), combined licenses (COLs)).
- The staff originally envisioned a three-phase process:



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Spring 2021 Working Definitions

Graded PRA approach

- A process that uses bounding, conservative, and/or qualitative assessments to establish a PRA's scope, level of detail, degree of plant representation, and/or level of peer review commensurate with the licensing stage (which dictates the level of detail and finality of the information used to develop the PRA) and how the PRA will be used in risk-informed decision-making.

Graded PRA

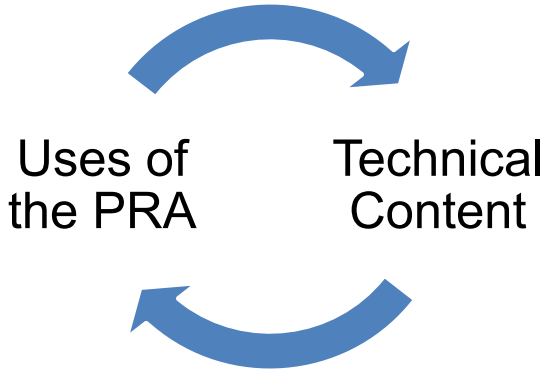
- A PRA of appropriate degree of scope, level of detail, plant representation, and technical adequacy to support a specific advanced reactor licensing application.
- Note: "Graded" should not imply that a design is not yet complete –acceptance of a graded PRA could only be considered if a design is well understood and conservatively modeled.

Dose/consequence-based criterion

- A potential entry condition to enable a graded PRA that uses bounding, conservative, and/or qualitative assessments of the doses or consequences arising from potential unplanned release scenarios, without consideration of the release scenario likelihood. This approach is being considered as a specific criterion for developing a graded PRA to adequately demonstrate that an applicant meets the intent of the Commission's Severe Accident Policy in an efficient and effective manner.

A Change in Direction

- Based on feedback during the Advanced Reactor Stakeholders public meeting held 5/27/2021, the staff learned that industry concerns were largely directed at grading how PRA was used in the licensing process, rather than grading the technical content of the PRA itself.
- There was general recognition from industry that the non-light water reactor (non-LWR) PRA standard already offers opportunities to grade the content of the PRA.



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Grading PRA Technical Content: Use of Qualifiers

- The non-LWR PRA standard (ASME/ANS RA-S-1.4-2021) uses qualifiers to indicate when certain supporting requirements (SRs) apply.
- Examples:
  - “For operating plants, …”
  - “For PRAs performed during the pre-operational stage, …”
- SRs without qualifiers apply to all life cycle stages.

Grading PRA Technical Content: The Risk Application Process

Section 3 of the non-LWR PRA standard (ASME/ANS RA-S-1.4-2021) provides a process to grade the PRA:

- Describes required activities to establish the capability of a PRA to support a particular risk-informed application.
- Designed to be used during all life cycle stages.

Stage A	Stage B	Stage C	Stage D	Stage E
• Characterize plant life cycle stage and PRA application • Define site characteristics • Select PRA scope and level of detail • Select risk significance criteria • Determine Capability Category needed to for each part of the PRA needed to support the application	• Determine if PRA scope, level of detail, and risk metrics are sufficient to support the application • Upgrade PRA as needed	• Determine if PRA standard requirements are sufficient for application. • Determine if insufficient requirements are relevant to the application.	• Determine if PRA has sufficient capability to support application • If not, determine if deviations are significant to the applicant • Upgrade the PRA as needed	• Use PRA to support the application • As needed, use supplementary analyses and requirements to support the application

Staff will provide PRA-related guidance for initial licensing in TICAP and/or ARCAP guidance.

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Focus on Understanding How and Why PRA is Used

- Since the May 2021 Advanced Reactor Stakeholders public meeting , the staff has further explored the scope of the PRA and how it is used in initial licensing.
- Significant effort has been invested in thoroughly understanding:
  - The uses and role of the PRA in the licensing process,
  - Whether those uses and role could be adequately addressed with other tools/techniques/bounding assessments, and
  - How that information fits into the overall approach to licensing under Part 50, Part 52, and preliminary Part 53.

Required Uses	Expected Uses
• Regulations • Rulemakings	• Regulatory guides (RGs) • Commission policy statements • Commission staff requirement memoranda • Standard review plans • IAEA SSR-2/1

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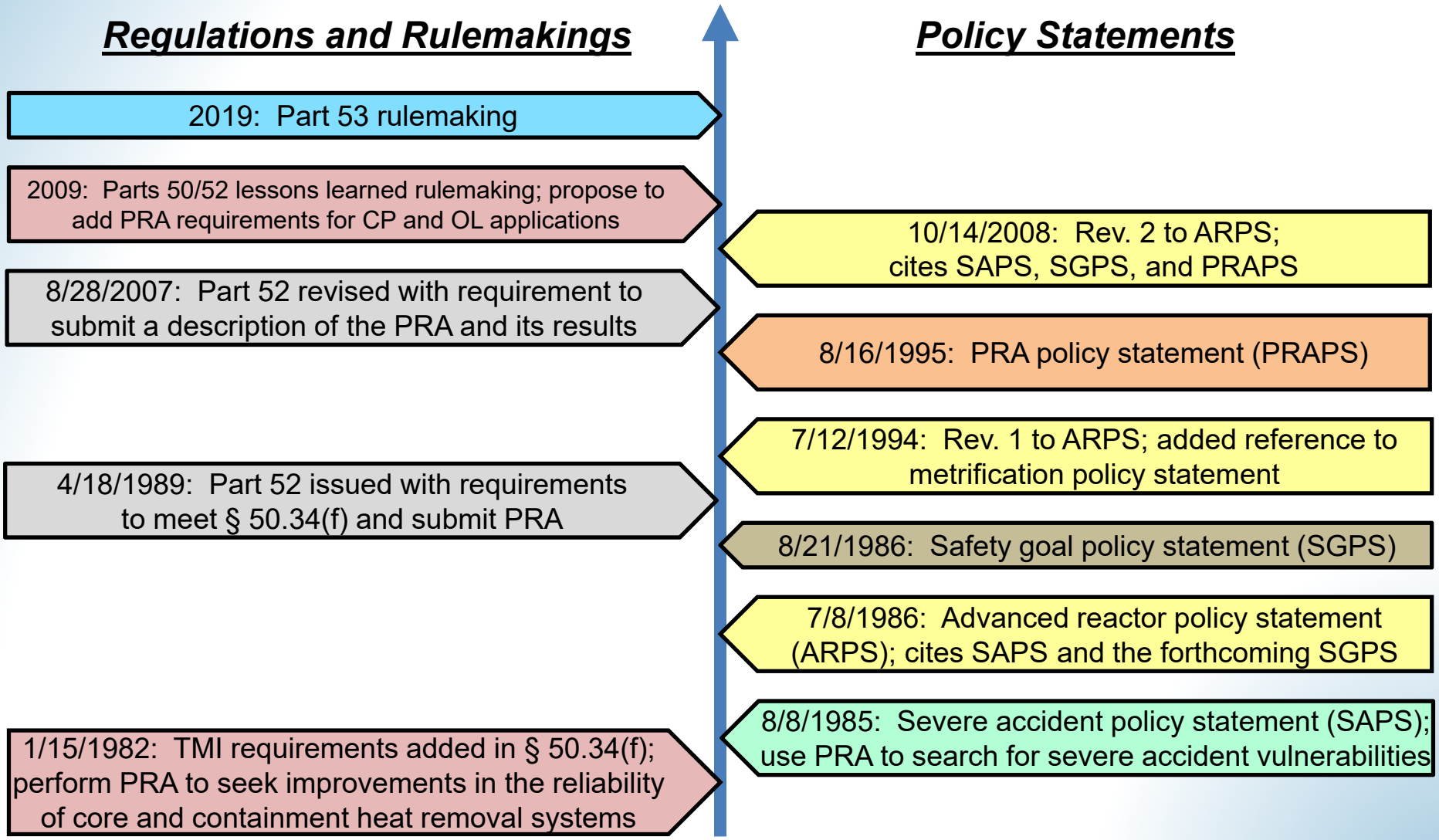
Why PRA? Post-TMI Recommendations

- ACRS letter* (May 16, 1979)
  - The ACRS believes that it is time to place the discussion of risk, nuclear and non-nuclear, on as quantitative basis as possible.
- Kemeny Report* (October 30, 1979) Recommendation #4:
  - The [Presidential] Commission recommends that continuing in-depth studies should be initiated on the probabilities and consequences (on-site and off-site) of nuclear power plant accidents, including the consequences of meltdown.
- Rogovin Report* (NUREG/CR-1250, January 1980), Recommendation #8:
  - The best way to improve the existing design review process is by relying in a major way upon quantitative risk analyses, and by emphasizing those accident sequences that contribute significantly to risk.

*Available from the Idaho National Laboratory Knowledge Management Library for the Three Mile Island Unit 2 Accident of 1979 at https://tmi2kml.inl.gov/HTML/Page1.html

Advanced Reactors and PRA



Advanced Reactor Policy Statement
(73 FR 60612; October 14, 2008)

- Comment labeled “Toshiba-3” (pp. 60613-60614):
  - Comment:
    - Policy statement makes no mention of the use of PRA.
    - Helpful to provide advanced reactor designers with interim guidance regarding NRC efforts for a risk informed, technology neutral licensing framework.
  - Response:
    - The NRC has established specific requirements related to the use of PRA in licensing new nuclear power plants, such as 10 CFR 52.47 and 10 CFR 50.71(h).
    - The Commission has also issued policy statements on:
      - Use of PRA in regulatory activities (PRAPS)
      - Severe accidents regarding future designs and existing plants (SAPS)
- Page 60616: The Commission also expects that advanced reactor designs will comply with the Commission’s SGPS.

PRA Policy Statement

(60 FR 42622; August 16, 1995)

- "The use of PRA technology should be increased in all regulatory matters to the extent supported by the state-of-the art in PRA methods and data and in a manner that complements the NRC's deterministic approach and supports the NRC's traditional defense-in-depth philosophy."
- "PRA and associated analyses (e.g., sensitivity studies, uncertainty analyses, and importance measures) should be used in regulatory matters, where practical within the bounds of the state-of-the-art, to reduce unnecessary conservatism associated with current regulatory requirements, regulatory guides, license commitments, and staff practices."
- "PRA evaluations in support of regulatory decisions should be as realistic as practicable and appropriate supporting data should be publicly available for review."
- "The Commission's safety goals for nuclear power plants and subsidiary numerical objectives are to be used with appropriate consideration of uncertainties in making regulatory judgments on the need for proposing and backfitting new generic requirements on nuclear power plant licensees."

Severe Accident Policy Statement

(50 FR 32138; August 8, 1985)

- Describes the policy the Commission intends to use to resolve safety issues related to reactor accidents more severe than design basis accidents (DBAs).
  - Main focus is on the criteria and procedures the Commission intends to use to certify new designs for nuclear power plants.
  - "Severe nuclear accidents are those in which substantial damage is done to the reactor core whether or not there are serious offsite consequences."
- Policy for new plant applications:
  - "Comply with current regulations, including the TMI requirements in 50.34(f)"
  - "Demonstrate technical resolution of all applicable Unresolved Safety Issues and the medium- and high priority Generic Safety Issues, including a special focus on assuring the reliability of decay heat removal systems and the reliability of both AC and DC electrical supply systems."
  - "Complete a PRA and consider the severe accident vulnerabilities the PRA exposes along with the insights that it may add to the assurance of no undue risk to public health and safety."
  - "Complete a staff review of the design with a conclusion of safety acceptability using an approach that stresses deterministic engineering analysis and judgment complemented by PRA."

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Safety Goal Policy Statement (51 FR 28044; August 4, 1986 as corrected and republished at 51 FR 30028; August 21, 1986)

- Qualitative goals
  - "Individual members of the public should be provided a level of protection from the consequences of nuclear power plant operation such that individuals bear no significant additional risk to life and health."
  - "Societal risks to life and health from nuclear power plant operation should be comparable to or less than the risks of generating electricity by viable competing technologies and should not be a significant addition to other societal risks."
- Quantitative objectives
  - "The risk to an average individual in the vicinity of a nuclear power plant [one mile] of prompt fatalities that might result from reactor accidents should not exceed one-tenth of one percent (0.1 percent) of the sum of prompt fatality risks resulting from other accidents to which members of the U.S. population are generally exposed."
  - "The risk to the population in the area near a nuclear power plant [10 miles] of cancer fatalities that might result from nuclear power plant operation should not exceed one-tenth of one percent (0.1 percent) of the sum of cancer fatality risks resulting from all other causes."
- Proposed general performance guideline (large release frequency – LRF):
  - "Consistent with the traditional defense-in depth approach and the accident mitigation philosophy requiring reliable performance of containment systems, the overall mean frequency of a large release of radioactive materials to the environment from a reactor accident should be less than 1 in 1,000,000 per year of reactor operation."

Large LWR Risk Surrogates

- NUREG-0880, Rev. 1, May 1983 (ML071770230), provides numerical interpretation of the quantitative health objectives (QHOs):
  - Individual early fatality risk (IEFR) ≤ 5E-7/ry
  - Individual latent cancer fatality risk (ILCFR) ≤ 2E-6/ry
- NUREG-1860, Vol. 2, December 2007 (ML080440215), derives surrogate risk metrics for large light water reactors (LWRs):
  - IEFR: Large early release frequency (LERF) ≤ 1E-5/ry
  - ILCFR: Core-damage frequency (CDF) ≤ 1E-4/ry

The non-LWR PRA standard (ASME/ANS RA-S-1.4-2021) does not use risk surrogates such as CDF, LRF, or LERF!!!

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Large Release Frequency

- SRM-SECY-89-144, June 5, 1990, ML051660712:
  - "Within a particular design class (e.g., LWRs, LMRs, HTGRs) the same subsidiary objectives [risk surrogates] should apply to both current as well as future designs…However, the Large Release Guideline relates to all current as well as future designs."
  - "The Commission believes that "adequate protection" is a case by case finding based on evaluating a plant and site combination and considering the body of our regulations."
- According to Forrest Remick (former Director of the Office of Policy Evaluation, ACRS member, and Commissioner), LRF was proposed to break a deadlock between the ACRS and the staff over the use of CDF and conditional containment failure probability (CCFP) as safety goals (see ML051660709):
  - Staff wanted to only include CDF; ACRS wanted to also include CCFP.
  - Dr. Remick received a call from the Executive Assistant to the then Commission Chairman [Palladino]. "[H]e asked me what I thought of getting out of the deadlock by eliminating both the CDF and the idea of a CCFP by substituting a Large Release Guideline of 10^{-6} per reactor year as a surrogate. In response, I laid out the following steps: if one assumes a CDF of 10^{-4}, a conditional probability of "core on the floor" of 10^{-1} (a probability still not accurately known), and a CCFP of 10^{-1} (which was bandied about at the time), then a Large Release Guideline of 10-6 per reactor year appeared to be a reasonable surrogate."
- SRM-SECY-12-0081, October 22, 2012, ML12296A158: "The Commission has approved the staff's recommendation (Option 2C) to transition from large release frequency to large early release frequency (LERF) at or before initial fuel load and discontinue regulatory use of large release frequency (LRF) and conditional containment failure probability thereafter."
- SECY-13-0029, March 22, 2013, ML13022A207:
  - "The Commission acknowledged that analyses indicated that the cancer fatality QHO was not the more controlling objective and that, if the prompt fatality QHO is met, the cancer fatality risk generally would be much lower than the cancer fatality QHO."
  - "Recognizing that the prompt fatality QHO is more controlling, the staff worked to develop a large release definition that focused on LRF being a surrogate for the prompt fatality QHO."
  - "In 1993, the staff concluded that defining large release beyond a simple qualitative statement related to its 10^{-6} per reactor year release frequency (such as is currently contained in the safety goal policy statement) was neither practical nor required for regulatory or design purposes."

Large Early Release Frequency

- The concept of LERF was originally developed by the Electric Power Research Institute, "PSA Applications Guide," TR-105396, August 1, 1995.
  - Use qualitative characteristics to identify large early release sequences
  - Avoids the need to perform source term and radiological consequence calculations
- Adopted by the NRC when RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," was developed in the late-1990s.
- Current definition provided in RG 1.200, "Acceptability of Probabilistic Risk Assessment Results for Risk-Informed Activities," Rev. 3, December 2020:
  - Large early release frequency (LERF) is defined as the sum of the frequencies of those accidents leading to rapid, unmitigated release of airborne fission products from the containment to the environment occurring before the effective implementation of offsite emergency response and protective actions such that there is the potential for early health effects. (Such accidents generally include unscrubbed releases associated with early containment failure shortly after vessel breach, containment bypass events, and loss of containment isolation.)

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Risk-Informed Regulation Definitions (1 of 2)

- Risk triplet (Kaplan and Garrick*, SRM-SECY-98-144**):
  - What can go wrong?
  - How likely is it?
  - What are the consequences?

$$R = \{\langle s_i, p_i(\varphi_i), \zeta_i(x_i)\rangle\}$$

- Risk assessment (SRM-SECY-98-144): A systematic method for addressing the risk triplet as it relates to the performance of a particular system (which may include a human component) to understand likely outcomes, sensitivities, areas of importance, system interactions and areas of uncertainty.
- Risk insights (SRM-SECY-98-144): The results and findings that come from risk assessments.
- Risk-informed approach (SRM-SECY-98-144): A philosophy whereby risk insights are considered together with other factors to establish requirements that better focus licensee and regulatory attention on design and operational issues commensurate with their importance to public health and safety.

*Kaplan, S. and Garrick, B. J., "On the Quantitative Definition of Risk," *Risk Analysis*, Vol. 1, Issue 1, March 1981.
**NRC, "Staff Requirements – SECY-98-144 – White Paper on Risk-Informed and Performance-Based Regulation," February 24, 1998, ML003752593.

Risk-Informed Regulation Definitions (2 of 2)

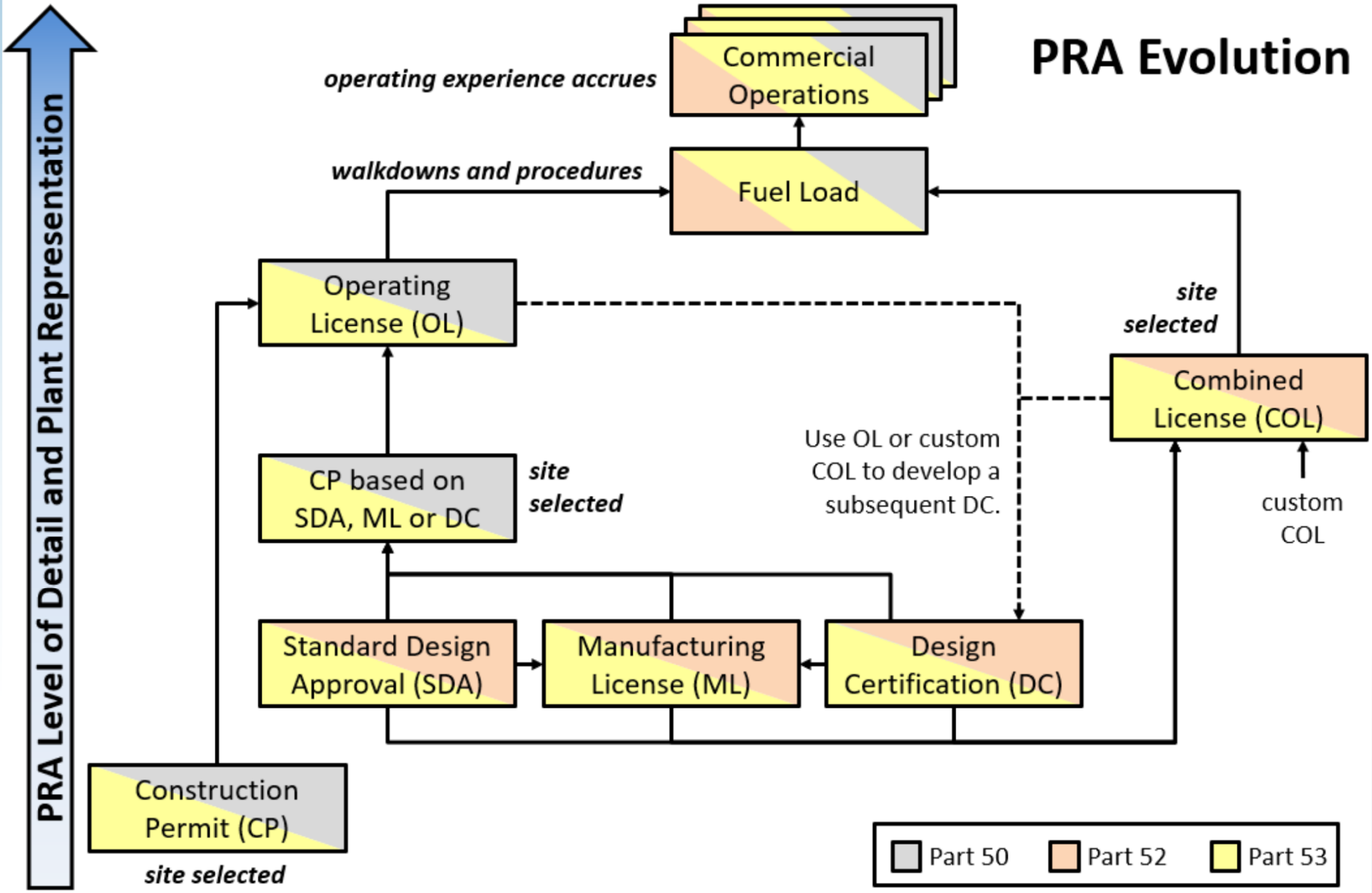
- PRA
  - **NRC online glossary**[*]: A systematic method for assessing three questions that the NRC uses to define "risk." These questions consider (1) what can go wrong, (2) how likely it is, and (3) what its consequences might be. These questions allow the NRC to understand likely outcomes, sensitivities, areas of importance, system interactions, and areas of uncertainty, which the staff can use to identify risk-significant scenarios. The NRC uses PRA to determine a numeric estimate of risk to provide insights into the strengths and weaknesses of the design and operation of a nuclear power plant.
  - **RG 1.200**[**]: An approach is considered to be a PRA when it (1) provides a quantitative assessment of the identified risk in terms of scenarios that result in undesired consequences (e.g., core damage or a large early release) and their frequencies and (2) comprises specific technical elements in performing the quantification.
  - **Draft RG 1.247**[†]: A risk assessment approach is considered to be a PRA when it (1) provides a quantitative assessment of the identified risk in terms of scenarios that result in undesired consequences (e.g., releases of radioactive material, radiological consequences) and their frequencies and (2) comprises specific PRA elements for quantifying risk.

[*]https://www.nrc.gov/reading-rm/basic-ref/glossary/probabilistic-risk-assessment-pra.html
[**]NRC, "Acceptability of Probabilistic Risk Assessment Results for Risk-Informed Activities," RG 1.200, Rev. 3, December 2020, ML20238B871.
[†]NRC, "Acceptability of Probabilistic risk Assessment Results for Advanced Non-Light Water Reactor Risk-Informed Activities," draft trial use RG 1.247, September 3, 2021, ML21246A216.

Role of the PRA in Initial Licensing

- Traditional role
  - Consistent with previous DC and COL applications
  - Includes, but not limited to:
    - Searching for severe accident vulnerabilities (SAPS)
    - TMI requirement § 50.34(f)(1)(i), which under Part 52 requires LWR applicants to "Perform a plant/site specific probabilistic risk assessment, the aim of which is to seek such improvements in the reliability of core and containment heat removal systems as are significant and practical and do not impact excessively on the plant."
    - Demonstrating that the QHOs are met (SGPS)
    - Using PRA in the design process (PRAPS)
  - Previously referred to as "PRA in a supporting role"
- Enhanced role
  - Any use of PRA beyond its traditional role
  - Includes, but not limited to:
    - Certain proposed required uses of PRA in preliminary 10 CFR Part 53 rule text (e.g., identifying licensing basis events (LBEs); classifying systems, structures, and components (SSCs); evaluating defense-in-depth (DID))
    - Voluntary risk-informed applications (e.g., risk-managed technical specifications (TS), risk-informed fire protection)
  - Previously referred to as "PRA in a leading role"

PRA Evolution



PRA Requirements for Part 50 CP and OL Applicants

- PRA not currently required for CP or OL applicants.
- SRM-SECY-15-0002, ML15266A023: "The Commission has approved the staff's recommendation to confirm that the Commission's guidance given in the "Policy Statement on Severe Reactor Accidents Regarding Future Designs and Existing Plants" and other Commission direction identified by staff apply to new 10 CFR Part 50 power reactor applications in a manner consistent with 10 CFR Part 52 design and license applications."
- The Part 50/52 lessons learned rulemaking (NRC-2009-0196; RIN 3150-AI66) proposes to add PRA-related requirements for CP applicants, OL applicants, and OL holders like the PRA-related requirements for Part 52 applicants and COL holders.

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PRA Requirements for Part 52 Applicants

- § 52.47(a)(27) requires DC applicants to describe the design-specific PRA and its results.
- § 52.79(a)(46) requires COL applicants to describe the plant-specific PRA and its results.
  - § 52.79(c)(1) requires COL applicants that reference an SDA to use and update the PRA information for the SDA to account for site-specific design information and any design changes or departures.
  - § 52.79(d)(1) requires COL applicants that reference a DC to use and update the PRA information for the standard DC to account for site-specific design information and any design changes or departures.
  - § 52.79(e)(1) requires that COL applicants that reference an ML to use and update the PRA information for the ML to account for site-specific design information and any design changes or departures.
- § 52.137(a)(25) requires SDA applicants to describe the design-specific PRA and its results.
- § 52.157(a)(31) requires ML applicants to describe the design-specific PRA and its results.

PRA Requirements for Part 52 COL Holders

- § 50.71(h)(1) requires that:
  - Each COL holder shall develop a Level 1 and a Level 2 PRA, and
  - The PRA must cover those initiating events and modes for which NRC-endorsed consensus standards on PRA exist 1 year before the scheduled date for initial loading of fuel.
- § 50.71(h)(2) requires that:
  - Each COL holder shall maintain and upgrade the PRA
  - The upgraded PRA must cover initiating events and modes of operation contained in NRC-endorsed consensus standards on PRA in effect 1 year before each required upgrade, and
  - The PRA must be upgraded every 4 years until the permanent cessation of operations under 10 CFR 52.110(a).
- § 50.71(h)(3) requires that each COL holder shall, no later than the date on which the licensee submits an application for a renewed license, upgrade the PRA required by 10 CFR 50.71(h)(1) to cover all modes and all initiating events.

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Subpart C-Design and Analysis Requirements
§ 53.450 Analysis Requirements
(3rd iteration preliminary rule text)

(a) *Requirement to have a probabilistic risk assessment.* A probabilistic risk assessment (PRA) of each commercial nuclear plant must be performed to identify potential failures, susceptibility to internal and external hazards, and other contributing factors to event sequences that might challenge the safety functions identified in 53.230 and to support demonstrating that each commercial nuclear plant meets the safety criteria of 53.220.

Traditional use of the PRA

Severe accident policy statement

Safety goal policy statement

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Subpart C-Design and Analysis Requirements
§ 53.450 Analysis Requirements
(3rd iteration preliminary rule text)

(b) *Specific uses of analyses.* The PRA, other generally accepted risk-informed approach for systematically evaluating engineered systems, or combination thereof must be used:

Enhanced use of the PRA

(1) In determining the licensing basis events, as described in 53.240, which must be considered in the design to determine compliance with the safety criteria in Subpart B of this part.

(2) For classifying SSCs and human actions according to their safety significance in accordance with 53.460 and for identifying the environmental conditions under which the SSCs and operating staff must perform their safety functions.

(3) In evaluating the adequacy of defense-in-depth measures required in accordance with 53.250.

PRA scope

- **All sources**
- **All hazards**
- **All modes**

(4) To identify and assess all plant operating states where there is the potential for the uncontrolled release of radioactive material to the environment.

(5) To identify and assess events that challenge plant control and safety systems whose failure could lead to the uncontrolled release of radioactive material to the environment. These include internal events, such as human errors and equipment failures, and external events, such as earthquakes, identified in accordance with Subpart D of this part.

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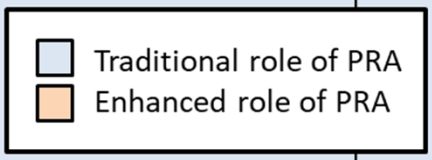
Uses of the PRA

Requirements/Uses	Part 50	Part 52	Part 53 Preliminary Rule Text
Submit description of PRA and its results	Currently none. Proposed in Part 50/52 lessons learned rulemaking (NRC-2019-0196; RIN 3150-AI66)	All applicants	All applicants
Develop, maintain, and upgrade PRA		COL holders	COL and OL holders
Required uses of PRA		Meet the TMI requirements in § 50.34(f)(1)(i) – Seek improvements in core and containment heat removal systems reliability	Use PRA to: • Search for severe accident vulnerabilities • Demonstrate that safety goals are met • Use PRA to evaluate changes to the facility described in FSAR (§ 53.1322) • Use PRA **or generally accepted risk-informed approaches for systematically evaluating engineered systems** to: o Identify LBEs o Evaluate DID o Classify SSCs o Support the FSP
Commission expectations (e.g., policy statements and SRMs)	• Search for severe accident vulnerabilities • Demonstrate that safety goals are met • Use PRA in design		
Voluntary uses of PRA	Voluntary risk-informed applications to establish or change the licensing basis		
Leveraged uses by the staff	• Focus the staff review • Inform the development of ITAACS, COL action items, D-RAP, etc. • Support oversight and inspections		



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Observations

- A risk-informed approach may be based on risk insights developed from:
  - A PRA (i.e., quantitative), or
  - A qualitative risk assessment
- PRA not used to support non-power production and utilization facility licensing:
  - Not addressed in NUREG-1537, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors"
  - Discussion with NRR/DANU staff
- Integrated safety analysis is required by 10 CFR Part 70 for certain licensees:
  - Risk-informed process, but does not require development of a PRA
- The current preliminary rule text for Part 53:
  - Builds on the traditional role of the PRA
  - Adds requirements that use PRA in an enhanced role

Three potential licensing pathways
- Enhanced PRA approach
- Traditional PRA approach
- TIRIMA approach

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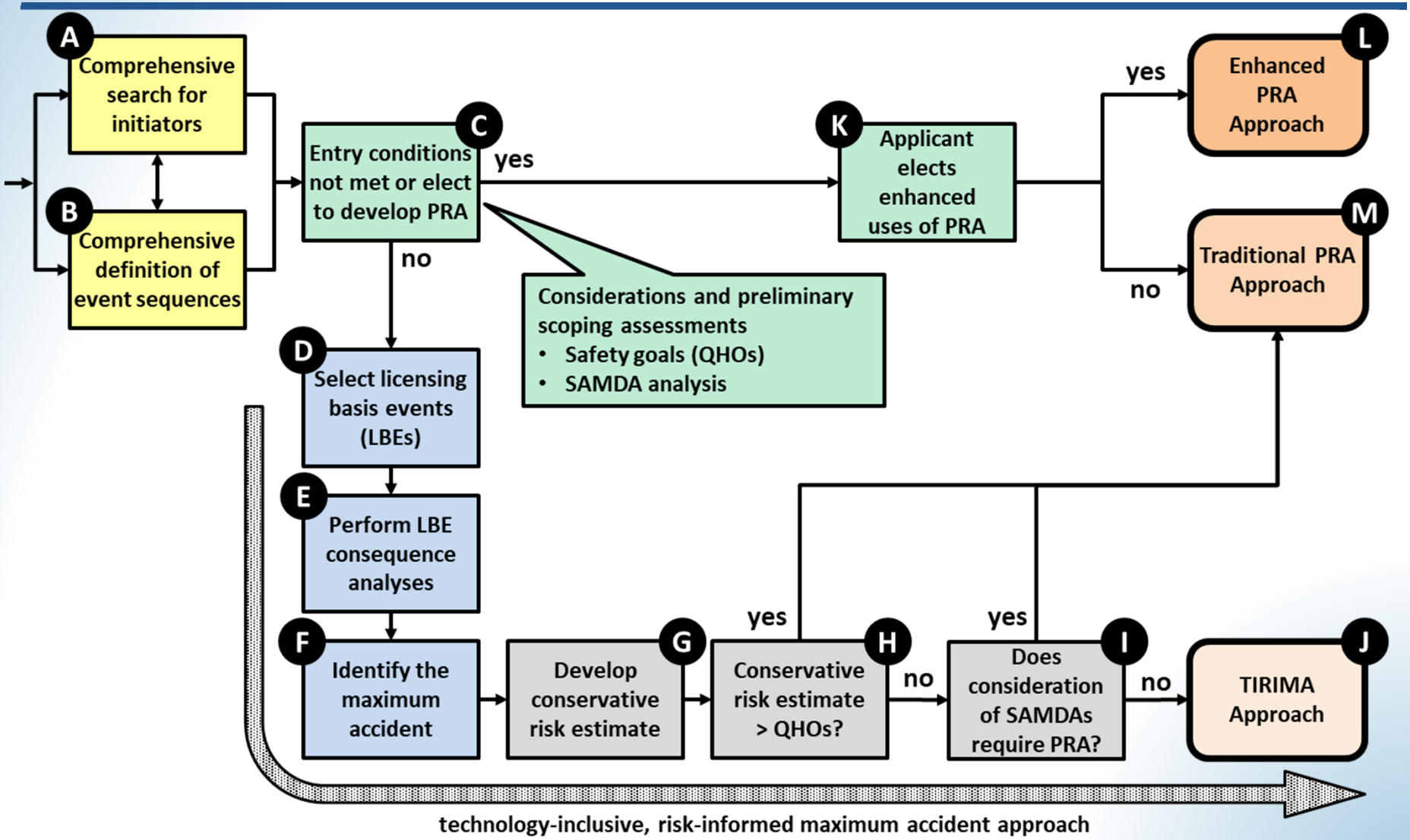
Three Licensing Pathways



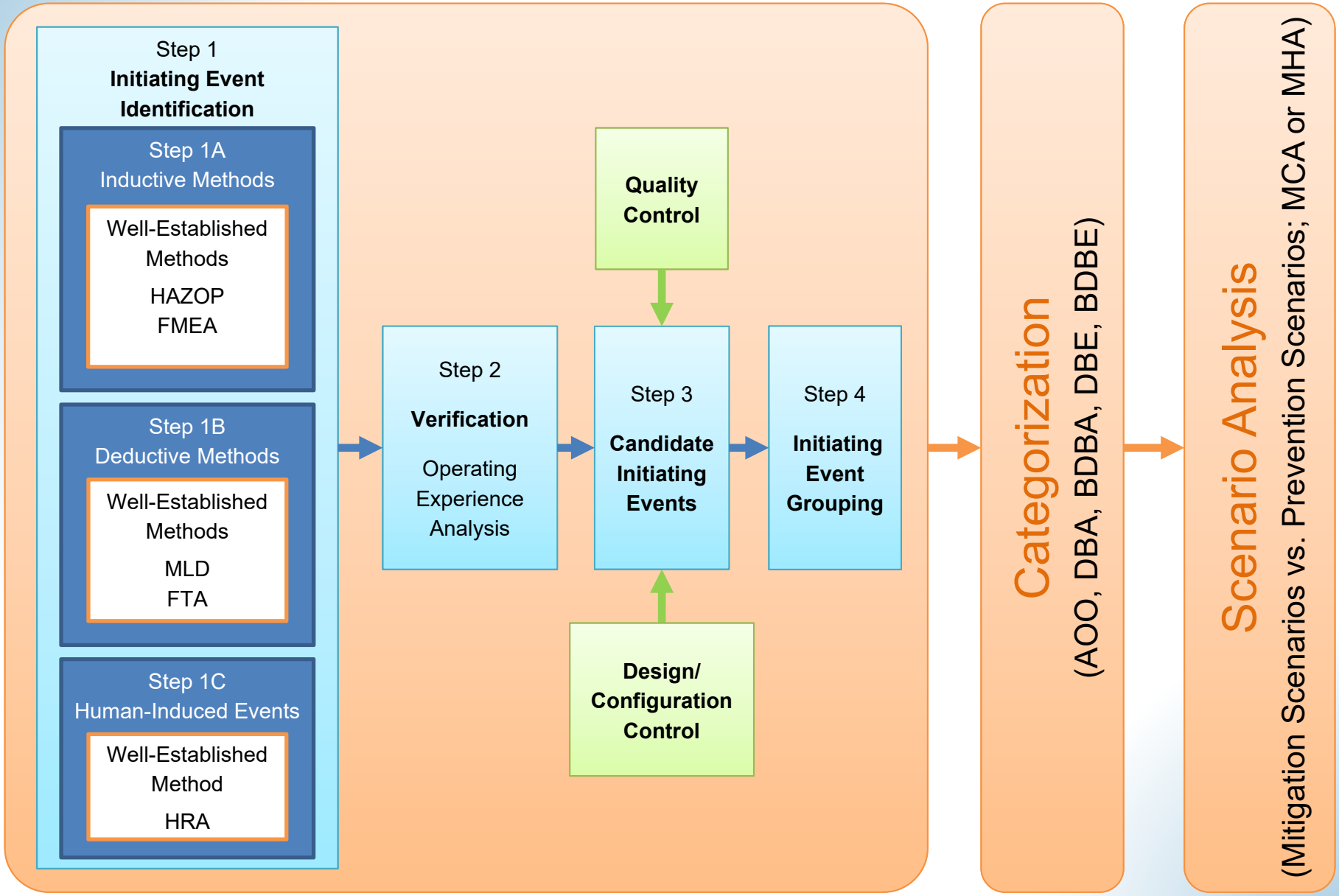
Development of "How-To" Guidance for the TIRIMA Approach (1 of 2)

- The staff intends to develop guidance for:
  - Box A: Comprehensive search for initiating events
  - Box B: Comprehensive definition of event sequences
  - Box C: Decision guidance and entry conditions
  - Box D: Licensing basis event selection
  - Box E: Licensing basis event consequence analysis
  - Box F: Maximum accident identification
  - Box G: Conservative risk estimation
- Leverage existing guidance and studies such as, but not limited to:
  - NUREG-1513, "Integrated Safety Analysis Guidance Document"
  - NUREG-1520, "Standard Review Plan for Fuel Cycle Facilities License Applications"
  - NUREG-1537, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors"
  - Occupational Safety and Health Administration regulations (29 CFR 1910.119), standards, handbooks, and guidance
  - EPRI TR 3002011801, "Program on Technology Innovation: Early Integration of Safety Assessment into Advanced Reactor Design - Preliminary Body of Knowledge and Methodology"

Development of "How-To" Guidance for the TIRIMA Approach (2 of 2)

- Initial thoughts:
  - Start with a blank sheet of paper
  - Use a combination of inductive and deductive methods
  - How much searching is enough? How do you know when you are finished?
  - Focus on how plant design actually works vs. how plant design is supposed to work
  - Consolidate/group similar items
  - Be (very) careful when screening
- Process:
  - Multi-disciplinary team effort
  - Independent review
  - Documentation
    - Tell the story
    - Capture assumptions and decisions

Initiating Event and Scenario Search



Initiating Events Analysis
Preliminary Table of Contents

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Path Forward

- Revise preliminary rule text developed for the "deterministic option" to allow use of the TIRIMA approach
- Develop guidance to implement the TIRIMA approach:
  - Leverage existing guidance to the extent possible
  - Outline of guidance to conduct the systematic and comprehensive search for initiators (Box A) has been developed
  - Developing outline of the entire guidance document
- Challenging technical issues:
  - Technology-inclusive definition of "severe accident"
  - Providing guidance to help applicants decide up-front if TIRIMA is a viable licensing pathway (TIRIMA entry conditions – Box C)
  - Using TIRIMA to support SAMDA analysis

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TIRIMA Approach

Discussion

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MEETING BREAK

Meeting to resume in 1 hour

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Subpart F – Requirements for Operation

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Subpart F – Requirements for Operation

- Operational objectives
- Transition from construction/manufacturing to operation
- Maintaining capabilities and availability of SSCs
- Maintenance, repair, and inspection programs
- Design control
- Staffing, training, personnel qualifications, human factors requirements
- Programs

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Subpart F - Programs

- Radiation protection
- Emergency preparedness (EP)
- Security programs
- Quality assurance
- Integrity assessment programs
- Fire protection
- Inservice inspection/inservice testing (ISI/IST)
- Criticality safety program
- Facility safety program (FSP)

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Overview of Topics for Discussion

- Shift Technical Advisor (STA) Position
- Load Following
- Certified Operators versus Licensed Operators
- Simulator Scope
- Training Program Review Guidance

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Shift Technical Advisor Position – Background

§ 53.753(f) requires a staffing plan describing numbers, positions, and qualifications of licensed operators and senior licensed operators, or certified operators, across all modes

- Must describe personnel providing support in plant operations, equipment surveillance and maintenance, radiological protection, chemistry control, fire brigades, engineering, security, and emergency response.
- Must also describe how the proposed licensed operator staffing, for plants requiring licensed operators, will be sufficient to assure that plant safety functions can be maintained; this must be supported by human factors engineering (HFE) analyses and assessments.
    - Guidance for evaluating these staffing plans is being developed by the staff in the form of interim staff guidance (ISG) to be used in conjunction with NUREG-1791

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Shift Technical Advisor Position

- Staff have considered various approaches to the STA role under Part 53 and several alternatives will be discussed here
- Staff are receptive to feedback on different approaches as further iterations of preliminary rule language are developed
- In developing preliminary Part 53 requirements, the staff considered that the 1985 Policy Statement on engineering expertise on shift (50 FR 43621) stated that the STA was an interim measure until goals that included upgrading human-system interfaces (HSIs) and operator training were achieved
  - Current perspective is that the upgrades to HSIs and operator training envisioned within this Policy Statement will be the norm under Part 53 and driven by regulatory requirements
- Staff recognize that this represents a policy issue and intend to use the Part 53 rulemaking process for Commission engagement

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Shift Technical Advisor Position (cont'd)

Generic Part 53 elimination of STA could be justified on following bases:

- Licensed operator training requirements on knowledge and abilities to maintain plant safety functions; review criteria would confirm testing of reactor theory, thermodynamics, systems, and emergency operations
- State-of-the-art HFE required in all settings where operators are fulfilling plant safety functions; design requirements for HSIs requiring operators be provided with information on safety parameters, safety system status, important component status, and core damage states
- HFE-based analyses and assessments required to demonstrate how licensed operator staffing levels will maintain safety functions and support full range of tasks needed for safety (irrespective of an STA)
- Part 53 codifies DID principles under § 53.250 and requires (in part) DID use compensates for uncertainties in state of knowledge and modeling capabilities, and for personnel reliability and performance

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Shift Technical Advisor Position (cont'd)

Staff have also considered alternative of codification of an STA staffing requirement, with provision for justifying case-by-case position omission:

- In such an approach, the following definition would be provided in § 53.750(b):

  Shift technical advisor means an individual possessing at least a baccalaureate in physical science, engineering, or engineering technology (or, alternately, a Professional Engineering license) and whose function is to provide independent on-shift engineering expertise, accident assessment, and technical advice to licensed operators at nuclear power plants.

- The staffing plan requirements of § 53.753(f) would be modified to include the following additional requirement for plants requiring licensed operator staffing:

  A description of how the shift technical advisor position, as defined by § 53.750(b), will be implemented during all plant conditions other than cold shutdown or refueling while shutdown or, alternatively, shall provide a justification for omission of the Shift Technical Advisor position that is supported by relevant human factors engineering-based analyses and assessments.

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Shift Technical Advisor Position (cont'd)

- Another alternative considered by staff would require that proposed staffing plans for facilities with licensed operators account for how on-shift engineering expertise will be provided
  - Such an approach would likely be accomplished by modifying the requirements of § 53.753(f) such that facilities requiring licensed operators would need to describe (in part) within staffing plans:
    - how the numbers and positions of licensed operators provide assurance that plant safety functions can be maintained, and
    - how on-shift engineering expertise will be provided for the on-shift crew
- Overall, the staff perspective currently remains that any STA position requirement would only apply to plants that require licensed operators

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Load Following – Background

§ 53.755, "Conditions for Operations Staffing for Operating or Combined Licenses under this Part"

- § 53.755(c) restricts control manipulations to licensed or certified operators.
- § 53.755(e) requires that operations (other than control manipulations) affecting reactor power level only occur while plant conditions are being monitored by a licensed or certified operator.
  - However, load-following is permitted if one of the following can immediately refuse demands from the grid operator when they could challenge safe operation or if precluded by equipment conditions:
    - the actuation of an automatic protection system,
    - an automated control system; or
    - a licensed or certified operator.

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Load Following (cont'd)

- Current intent is to supplement rule with guidance (e.g., ARCAP ISG)
- While preliminary, the following illustrates general staff perspectives:
  - Load following should be restricted to power levels where automation supports needed plant operations in order to avoid transients (e.g., if one feedwater train must be secured as part of reducing power <50% and automation cannot accomplish this, then 50% becomes the bottom of the load following envelope)
  - If the actuation of an automatic protection system will be relied upon to truncate/terminate load following, then any such protective actions should not be the same as those credited for core protection and should use more restrictive setpoints than those credited for safety purposes (avoids challenging limits)
  - Crediting operators requires an immediate capacity to take control
  - No restriction envisioned on facility types if an adequate design is demonstrated; usage of certified operators could be acceptable

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Certified Operators – Background

- § 53.755(a) requires facility licensees to have licensed operators unless they can meet criteria of § 53.755(b) to use certified operators
- § 53.755(b) contains the requirements that must be met in order to justify not using any licensed operators as a part of facility staffing
  - Two current proposals for criteria
  - The first proposal would require the following:
    - No human actions for event mitigation required to meet safety criteria, achieve safety functions, or provide DID
    - PRA demonstrating the evaluation criteria for each event sequence can be met without human action for mitigation;
    - LBE response not needing human action for SSCs to perform
  - The second proposal would require the design-basis accident safety criteria to be met without mitigation by human actions, active engineered features, or passive design features (except for only those passive features that can survive LBEs and not be defeated by credible human errors)

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Certified Operators – Background (cont'd)

- § 53.755(i) contains specific requirements for plants using certified operators
  - Certified operator are responsible for specified administrative functions.
  - Certified operator staffing must always ensure continuity of responsibility for facility operations during the operating phase.
  - Continuous monitoring of fueled units with the following capabilities:
    - receiving plant operating data and parameters
    - ability to immediately initiate a reactor shutdown
    - ability to promptly dispatch ops/maintenance personnel
    - the ability to implement any emergency plan responsibilities
    - conducting reactivity manipulations that require human action

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Certified Operators – Background (cont'd)

- § 53.774, "Issuance of Certificates" (for Certified Operators)
  - Requires that facility licensees ensure that individuals to be certified:
    - complete either a high school diploma or GED
    - complete the approved initial training program
    - pass an initial operator certification examination
    - demonstrate competence in conducting control manipulations
    - meet medical condition requirements

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Certified Operators – Background (cont'd)

- § 53.775, "Conditions of Certificates" (for Certified Operators)
  - Requires facility licensees to ensure that certified operators:
    - only perform duties at facilities for which they are certified
    - complete a continuing training program
    - pass periodic continuing training examinations
    - Complete biennial medical examinations
    - maintain proficiency in accordance with the facility program

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Purpose of Certified Operator Alternative

- If a facility lacks an operator role in safety (e.g., an autonomous reactor design), then a key driver warranting federal licensing of individuals is removed (i.e., operator performance would not have a credible influence on public health and safety outcomes within that context)
  - Regardless of whether the operators were licensed, the facility itself would still be licensed by the NRC
- Important administrative job tasks that would remain still need to be accomplished by adequately qualified personnel.
  - Precedent shows that similar administrative tasks have been fulfilled by non-licensed personnel, such as Certified Fuel Handlers

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Purpose of Certified Operator Alternative (cont'd)

- Staff are endeavoring to create a durable rule; part of this is accounting for the possibility of future advancements in safety
- While the framework for certified operators parallels that for licensed operators, there is less regulatory interface and more flexibilities; this brings with it the potential for cost savings on the part of the industry
  - Current industry burden estimates for staff fee-billable hours suggest such differences may reduce costs

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Certified Operators versus Licensed Operators

Comparison of licensed and certified operator program components:

Program Component	Licensed Operator	Certified Operator
NRC approval of training & exam programs required?	Yes	Yes
NRC approval of exams prior to administration?	Yes	No
NRC approval of operator applications & medical?	Yes	No
NRC approval of simulators for use in training & exams?	Yes	No
Required submittal of renewals & terminations?	Yes	No
NRC approval of examination waivers?	Yes	No
Flexibility for requalification training & exam periodicity?	No	Yes

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Certified Operators versus Licensed Operators (cont'd)

- Certified operators would be trained to conduct reactivity manipulations as part of their initial training program
- Due to the non-licensed nature of certified operators, the facility licensee retains ultimate accountability for operations
  - In contrast, licensed operators are individually accountable
  - Certified operators have a reduced operator safety role due to facility safety characteristics
- § 53.753(e) requires an operating experience program; staff envision guidance for licensed and certified operator training programs will include the incorporation of operating experience
- There are no known industry initiatives for maintaining Part 53 programs consistent within facility classes; staff are working to ensure compliance with Atomic Energy Act (AEA) requirements
- If a facility licensed with certified operators was determined to later need licensed operators (e.g., the § 53.755(b) criteria were no longer met), a safety issue may exist; NRC would have authority to modify the facility's license as necessary

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Simulator Scope – Background

- § 53.765(e) establishes simulation facility requirements for plants with licensed operators and § 53.773(e) establishes less stringent simulation facility requirements for plants with certified operators
  - Full-scope simulators are not mandated; partial scope simulators may be acceptable, provided that the scope is adequate to meet intended usage; alternatives to simulators are possible as well
  - Simulation facilities for plants with licensed operators must be approved by the Commission if the facility licensee will rely upon them for training, experience requirements, or for initial or requalification examinations
    - Equivalent approval not required for certified operator facilities
  - Must demonstrate that adequate simulator scope is provided to support HFE analyses/assessments in order to use a simulation facility for conducting these analyses/assessments

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Simulator Scope

- In developing preliminary rule language, staff reviewed Section 306 of the Nuclear Waste Policy Act (NWPA) and 52 FR 9453 which discussed implementation of the Act's simulator-related provisions:
  - Flexibilities were historically provided to allow for potential use of the plant itself, and/or a plant-referenced simulator, and/or some other type of simulation device (such as a part-task or basic-principles simulator) for the conduct of the simulator portion of the operating test
  - The NRC's stated intent was not to permit the initiation of transients on the plant itself if used as a simulation facility; rather, the use of the plant was envisioned as an option that might be used in conjunction with another simulation device or devices, in lieu of a plant-referenced simulator
- Current perspective is that NWPA does not mandate NRC to require that plants have *simulators,* but instead requires regulations address the use of *simulations* in training; flexibility exists to allow the use of the actual plant to "simulate" tasks for training and operating test purposes without having a separate simulation facility (e.g., simulator)

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Simulator Scope (cont'd)

- Philosophical basis behind preliminary rule language is:
  - Plant-referenced, full-scope simulators remain the preferred approach and would represent the best route for meeting Part 53 requirements
    - Staff expect majority of Part 53 applicants will have them due to regulatory certainty and technology lowering the associated costs
  - Existing regulations do not strictly mandate plant-referenced, full-scope simulators either, but still adopted by all current power reactors
  - Part 53 rule language leaves alternatives to simulator usage (full-scope or otherwise), but the burden will be on the applicant to demonstrate how the following are supported:
    - Licensed or certified operator training and exams; simulators used require sufficient scope and fidelity for operators to acquire and demonstrate knowledge and abilities needed for job duties.
    - Experience requirements (i.e., reactivity manipulations)
    - HFE analyses/assessments and HSI design testbed needs

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Training Program Review Guidance – Background

- § 53.765(a) requires initial licensed operator training programs to:
  - Be based upon a systems approach to training (SAT)
  - Ensure that license applicants at the facility will possess the knowledge, skills, and abilities necessary to:
    - protect the public health, and
    - maintain design-specific plant safety functions
  - Be approved by the Commission prior to use
- § 53.765(c) requires facilities to establish requalification training programs for licensed operators. These programs must:
  - Be based on SAT
  - Ensure that reactor operators and senior reactor operators maintain knowledge, skills, and abilities necessary to protect the public health and maintain those plant safety functions specific to the facility design.
  - Be conducted for continuous period not to exceed 24 months.
  - Be approved by the Commission.

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Training Program Review Guidance (cont'd)

- § 53.773(a) requires initial operator certification training programs to:
  - Be based upon SAT
  - Ensure that certified operator trainees will possess the knowledge, skills, and abilities necessary to protect the public health
  - Be approved by the Commission prior to use
- § 53.773(c), requires continuing training programs for certified operators to:
  - Be based upon SAT
  - Ensure that certified operators maintain the knowledge, skills, and abilities necessary to protect the public health
  - Be approved by the Commission prior to use
- §§ 53.780-781 addresses training requirements for other plant personnel
  - § 53.781, "Training and Qualification Requirements"
    - Requires use of SAT
    - Requires the training and qualification of supervisors, technicians, and other appropriate operating personnel to be provided for

Subpart F – Staffing, Training, Personnel Qualifications, and Human Factors Requirements

Training Program Review Guidance (cont'd)

- Applicants might forgo training program accreditation, requiring:
  - Staff to determine acceptability of proposed training programs
  - Staff assessment of ongoing conformance of facility licensee training programs with applicable regulatory requirements;
  - Staff inspections of other training programs required by § 53.781
- Staff will require guidance to support determinations regarding whether SAT is adequately applied; existing guidance (e.g., NUREG-1220) is dated
  - Working group established to develop this guidance for both initial and continuing training with objective to have an ISG developed no later than 2024 to support Part 53 rulemaking
    - Effort underway to accelerate development to support near-term applicants applying under Parts 50/52 if needed

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Subpart F – Requirements for Operation

Discussion

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Final Discussion and Questions

December 17th Agenda

9:30am – 9:35am	Opening Remarks
9:35am – 11:30am	Update on TICAP/ARCAP Guidance Document Developments
11:30am – 11:45am	Break
11:45am – 1:00pm	U.S. Nuclear Energy Institute / U.S. NIC Presentation: Letter of November 5, 2021 and Attachments
1:00pm – 2:00pm	Lunch Break
2:00pm – 3:50pm	U.S. Nuclear Energy Institute / U.S. NIC Presentation (continued)
3:50pm – 4:30pm	Discussion

Advanced Reactors

Overview of ARCAP Roadmap ISG and TICAP DG White Papers

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Purpose

- Provide the ACRS Future Plant Designs Subcommittee an update on the Advanced Reactor Content of Application Project (ARCAP) and Technology Inclusive Content of Application Project (TICAP) guidance document developments since the last Subcommittee briefing in July of 2021
    - Highlight some of the key draft white paper guidance with particular attention to portions of the guidance that maybe of interest to the ACRS
- Key documents associated with this presentation are available on NRC's Advanced Reactor ARCAP/TICAP public webpage (see: https://www.nrc.gov/reactors/new-reactors/advanced/details.html#advRxContentAppProj)

ARCAP/TICAP Background

- Previous ACRS Subcommittee briefings provided:
  March 17, 2021, and July 21, 2021
- ARCAP/TICAP
  - Purpose is to develop technology-inclusive, risk-informed and performance-based application guidance
  - Developed to support 10 CFR Part 50, Part 52, and Part 53 applications
    - Near-term need to develop guidance to support expected advanced reactor Part 50/52 applications using the licensing modernization project (LMP) process
    - LMP process endorsed in RG 1.233, “Guidance for a Technology-Inclusive, Risk-Informed, and performance-based Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light-Water Reactors”
    - ARCAP/TICAP guidance will be revised as Part 53 proposed rule language is adjusted

ARCAP/TICAP Background

- TICAP guidance
  - LMP process is used to define guidance for the content of major portions of the Safety Analysis Report (SAR)
    - LMP process uses risk-informed, performance-based approach to select LBEs, develop SSC categorization, identify special treatments for SSCs, and ensure DID adequacy
  - Industry developing key portions of TICAP guidance for NRC endorsement
  - Industry TICAP guidance will be supplemented by NRC staff-developed guidance as necessary
- ARCAP guidance
  - Broader in nature than TICAP and intended to cover guidance for SMR and non-LWR applications for a COL, CP, OL, DC, SDA, or ML.
  - Encompasses TICAP guidance and provides supplemental and additional guidance for SAR and application requirements beyond the SAR.

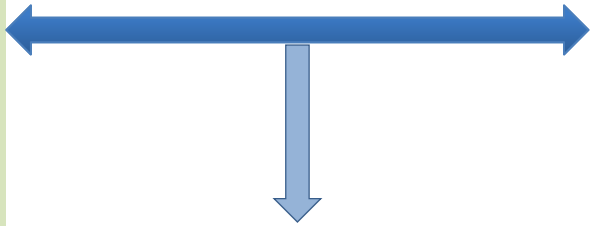
ARCAP and TICAP - Nexus

Outline SAR – Based on TICAP Guidance

1. General Plant Information, Site Description, and Overview of the Safety Case
2. Methodologies and Analyses
3. LBE Analysis
4. Integrated Evaluations
5. Safety Functions, Design Criteria, and SSC Safety Classification
6. Safety-Related (SR) SSC Criteria and Capabilities
7. Non-safety-related with special treatment (NSRST) SSC Criteria and Capabilities
8. Plant Programs

Additional SAR Content –Outside the Scope of TICAP

9. Control of Routine Plant Radioactive Effluents, Plant Contamination, and Solid Waste
10. Control of Occupational Doses
11. Organization and Human-System Considerations
12. Post-construction Inspection, Testing and Analysis Programs



Audit/inspection of Applicant Records

- Calculations
- Analyses
- P&IDs
- System Descriptions
- Design Drawings
- Design Specs
- Procurement Specs
- Probabilistic Risk Assessment

Additional Portions of Application

- Technical Specifications
- Technical Requirements Manual
- Quality Assurance Plan (design)
- Fire Protection Program (design)
- Quality Assurance Plan (construction and operations)
- Emergency Plan
- Physical Security Plan
- Special nuclear material (SNM) physical protection program
- SNM material control and accounting plan
- Cyber Security Plan
- Fire Protection Program (operational)
- Radiation Protection Program
- Offsite Dose Calculation Manual
- Inservice inspection/Inservice testing (ISI/IST) Program
- Environmental Report
- Site Redress Plan
- Exemptions, Departures, and Variances
- FSP (under consideration for Part 53 applications)

- SAR structure based on clean sheet approach

*Additional contents of application outside of SAR are still under discussion. The above list is draft and for illustration purposes only.

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ARCAP/TICAP Background

- Status of ARCAP ISG Draft White Papers

ARCAP ISG Title	Date	Accession No.
Review of Risk-Informed, Technology-Inclusive Advanced Reactor Applications - Roadmap	Dec 2, 2021	ML21336A702
Chapter 2, “Site Information”	July 6, 2021	ML21189A031
Chapter 9, “Control of Routine Plant Radioactive Effluents, Plant Contamination and Solid Waste	July 6, 2021	ML21189A033
Chapter 10, “Control of Occupational Doses”	July 6, 2021	ML21189A035
Chapter 11, “Organization and Human-System Consideration”	Nov 5, 2021	ML21309A020
Chapter 12, “Post Construction Inspection, Testing and Analysis Program”	Oct 21, 2021	ML21294A266
Licensing Modernization Project-based Approach for Developing Technical Specifications	May 10, 2021	ML21133A490
Risk-Informed, Performance-Based Fire Protection Program (for Operations)	Sept 10, 2021	ML21253A134
Risk-Informed ISI/IST Programs	Aug 4, 2021	ML21216A051

ARCAP/TICAP Background

- Status of TICAP Guidance Documents

TICAP Title	Date	Accession No.
NEI 21-07, Revision 0, Technology Inclusive Guidance for Non-Light Water Reactors Safety Analysis Report Content for Applicants Utilizing NEI 18-04 Methodology	Aug 30, 2021	ML21250A378
RG Draft White Paper, "Guidance for a Technology-Inclusive Content of Application Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Advanced Reactors"	Dec 2, 2021	ML21336A697

- TICAP guidance documents being revised based on continuing interactions with stakeholders
  - December 14, 2021, public workshop
    - During this meeting, NEI 21-07, Revision 0-B was discussed (ADAMS Accession No. ML21343A292)
  - Planning for another public workshop in mid-January 2022

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Advanced Reactor Content of Application Project - Overview

ARCAP – High Level Overview

- ARCAP Roadmap ISG
  - Proposes a 12-chapter SAR guidance structure
  - Guidance for first 8 SAR chapters references the TICAP guidance
  - Chapters 9, 10, 11, and 12 point to individual ISGs developed for each SAR chapter
  - Includes pointers to draft white papers, guidance under development or to be developed for portions of the application outside the SAR
    - Examples of guidance that the staff has developed: TS, Risk Informed ISI/IST, and Fire Protection for Operations
    - Examples of high-level guidance embedded in the Roadmap ISG: Technical Requirements Manual, Quality Assurance Plan, Fire Protection (design), and Offsite Dose Calculation Model
    - Examples of guidance being considered: security, emergency planning, material control and accountability, financial qualification and cyber security

ARCAP – High Level Overview

- ARCAP Roadmap ISG (continued)
  - Includes several appendices:
    - Appendix C on preapplication engagement guidance
      - Based on white paper discussed extensively during advanced reactor public stakeholder meetings
      - Purpose of Appendix C is to capture the white paper guidance in a durable product that will have the benefit of a formal public comment period
    - Appendix D on Analysis of Applicability of NRC Regulations to non-LWRs (plan to include later)
      - Based on white paper discussed extensively during advanced reactor public stakeholder meetings (ADAMS Accession No. ML21175A287)
      - Purpose of Appendix D is to capture the white paper guidance in a durable product that will have the benefit of a formal public comment period

ARCAP – High Level Overview

- ARCAP Roadmap ISG (continued)
  - Includes several appendices (continued):
    - Appendix E on CP guidance
      - Three parts to draft CP guidance
        - Common portion applicable to both LWRs and non-LWRs
          - Will be updated to be consistent with LWR CP ISG when it is issued
        - Portion applicable to LMP based approach – point to TICAP CP guidance
        - Portion applicable to CP guidance outside the scope of TICAP

ARCAP – High Level Overview

- ARCAP Chapter 2: Site Information
  - Supplements information in the SAR that is outside the scope of LMP.
  - Intent is to limit the amount of material in SAR Chapter 2 to what is necessary for establishing safety significant design parameters and for performing the safety analysis, along with its supporting bases.
  - If necessary, additional supporting information (e.g., historical records, geological data, etc.) could be documented in a separate report available for audit.
  - Section 2.6 includes a process for establishing the ground motion response spectrum using the Senior Seismic Hazard Analysis Committee guidance

- ARCAP Chapters 9 and 10: Normal Effluents and Occupational Dose
  - Applies a performance-based approach for level of detail of information provided in the SAR

ARCAP – High Level Overview

- ARCAP Chapter 11: Organization and Human-System Consideration
  - Developed to support near-term Part 50 and 52 applications with a more traditional concept of operations
    - Guidance will be updated later to include concepts discussed as part of the Part 53 proposed rulemaking effort
  - Human Factors Engineering
    - NRC staff identified a need to provide guidance in this area to supplement LMP and the associated pending TICAP guidance
    - LMP provides human factors insights but provides limited guidance on how to develop a HFE program
    - ARCAP Chapter 11 ISG covers HFE information that would support NRC findings

ARCAP – High Level Overview

- ARCAP Chapter 11 – Organization and Human-System Consideration (continued)
  - Operator Licensing
    - Proposed guidance extends beyond what would be expected in an application
      - Centrally located guidance to provide a holistic approach to operator licensing
        - May eventually split out guidance not specifically associated with the content of an application
    - Guidance includes areas such as:
      - Description and qualification of simulator used to administer initial operator licensing examinations
      - Use of simulator for operations training experience and examinations during construction
      - Operator license issuance prior to fuel load
  - Operator Staffing guidance includes areas such as:
    - Option of providing technical basis for control room staffing in conjunction with control room configuration that would support capturing the requirements necessary in a DC rulemaking
    - Provide technical basis that could support a future exemption from §§ 50.54(m) and/or 50.54(k) requirements

ARCAP – High Level Overview

- ARCAP Chapter 12 – Post Construction Inspection, Testing and Analysis Program
  - Intended to provide guidance to the NRC staff regarding application content that would support making the finding that the applicant has met the applicable Part 50 and Part 52 regulations
  - ISG differentiates between 10 CFR Part 52 applicants that must include inspections, tests, analysis and acceptance criteria (ITAAC) and 10 CFR Part 50 applications that are not required to include ITAAC.
  - Requirements to describe preoperational testing and initial operations in OL and COL applications are contained in 50.34(b)(6)(iii) and 52.79(a)(28), respectively.
  - Provides guidance for:
    - post-construction inspection, preoperational testing (i.e., tests conducted following construction and construction-related testing, but prior to initial fuel load), analysis verification, and
    - initial startup testing (i.e., tests conducted during and after initial fuel load, up to and including initial power ascension).

ARCAP – High Level Overview

- ARCAP TS Guidance
  - The text in the 10 CFR 50.36 regulations for TS content require adaptation to correlate to the analysis and outputs of the risk-informed LMP approach described in NEI 18-04.
    - 10 CFR 50.36 requirements for safety limits, limited safety system settings, and limiting condition for operations Criteria 1 through 3 involve challenges to the “integrity of a fission product barrier.”
    - To evaluate the acceptability of risk-informed TS for advanced reactors, this ISG correlates the 10 CFR 50.36 text with appropriate NEI 18-04 process analysis/outputs. These analysis/outputs include:
      - required safety functions
      - SR SSCs
      - frequency-consequence (F-C) target
      - 10 CFR 50.34 dose limits

ARCAP – High Level Overview

- ARCAP Fire Protection for Operations
  - 10 CFR 50.48(a) requires that each operating nuclear power plant have a fire protection plan that meets the requirements of either 10 CFR Part 50, Appendix A, Criterion 3 for LWRs or the applicant's proposed principal design criteria (PDC) that have been deemed acceptable by the NRC.
    - Although 10 CFR 50.48(c) – NFPA 805 – does not apply to non-LWRs concepts associated with this risk-informed approach are included in the draft ISG
  - The scope of this ISG addresses the review of the application content regarding the fire protection program for operations including application descriptions of:
    - Management policy and program direction and the responsibilities of those individuals responsible for the program/plan's implementation.
    - The integrated combination of procedures and personnel that will implement fire protection program activities.

ARCAP – High Level Overview

- ARCAP Risk-Informed ISI/IST
  - ISG purpose is to facilitate the review of advanced reactor applications that use a risk-informed approach to developing their ISI/IST programs
  - ISG guidance requires the use of risk information from a plant-specific PRA that is in conformance with an NRC endorsed PRA standard
  - For advanced LWRs, guidance on how to risk-inform ISI/IST already exists (RG 1.175, and 1.178) and is used in the ISG
  - 10 CFR Part 50 contains only general requirements (e.g., 50.34(b)(6)(iv)) related to non-LWR ISI/IST programs, although ASME has recently issued Section XI, Division 2 - NRC has reviewed and issued DG-1383 for public comment on endorsement of ASME Section XI, Division 2
  - For non-LWR ISI, applicants are expected to use the risk information from their plant-specific PRA to identify the piping, reactor coolant boundary, pressure retaining and passive components and their supports to be included in the program, along with other components whose failure could prevent a safety function from being accomplished

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ARCAP – High Level Overview

- ARCAP Risk-Informed ISI/IST (continued)
  - For non-LWR IST, applicants are expected to use the risk information from their plant-specific PRA and associated design reviews to identify the active valves, pumps and dynamic restraint devices and the passive components with active safety functions to be included in the program.
  - For non-LWR ISI, the ISG is based upon the applicant using the requirements in ASME Section XI, Division 2, “Requirements for Reliability and Integrity Management (RIM) Programs for Nuclear Power Plants” (which is the subject of draft RG-1383).

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Technology Inclusive Content of Application Project - Overview

TICAP – High Level Overview

- TICAP guidance
  - Goal is to develop technology-inclusive guidance that proposes an optional formulation of advanced reactor application content that is based on a risk-informed, performance-based approach for demonstrating that plant safety meets the underlying intent of the current requirements
  - Guidance is intended to increase efficiency of developing and reviewing an application
  - Scope is governed by the LMP process to facilitate a systematic, technically acceptable, and predictable approach for developing key portions of a design's SAR
    - LMP provides process for identifying LBEs, determining SSC categorization, establishing special treatments for SSCs, and ensuring DID adequacy

TICAP – High Level Overview

- TICAP SAR Structure
  - Chapter 1 - General Plant and Site Description, And Overview of The Safety Case
    - The information in this chapter should allow the reviewer to obtain a basic understanding of the overall facility, such as the type of permit, license, certification or approval requested, the number of plant units, a brief description of the proposed plant location, and the type of advanced reactor being proposed.
  - Chapter 2 - Methodologies and Analyses
    - An important part of the design process for reactor designs is the identification of events that could challenge key safety functions and layers of defense against the release of radioactive materials. Therefore, a key part of the review of an advanced reactor application is the selection of LBEs.

TICAP – High Level Overview

- TICAP SAR Structure
  - Chapter 3 – Licensing Basis Events
    - The information in this chapter should describe the systematic and reproducible process and methodology used to select the LBEs, and the specific analysis and evaluation of the selected LBEs for the proposed design. The analysis in this section is primarily described in terms of event sequences comprised of an initiating event, the plant response to the initiating event (which includes a sequence of successes and failures of mitigating systems) and a well-defined end state. The consequences from LBEs are expressed as dose at the exclusionary boundary and compared to the F-C curve in LMP documentation.
  - Chapter 4 – Integrated Evaluations
    - The information in this chapter should describe the integrated risk of all LBEs selected for the proposed design and evaluated against three cumulative risk targets and the DID evaluation.

TICAP – High Level Overview

- TICAP SAR Structure
  - Chapter 5 - Safety Functions, Design Criteria, and Systems, Structures, and Components Classification
    - As part of the LMP process, LBEs are generally defined in terms of successes and failures of SSCs that perform safety functions and are modeled in the PRA. Therefore, the PRA safety functions are those functions responsible for the prevention and mitigation of an unplanned radiological release from any source within the plant.
    - The information in this chapter should describe the proposed PDC necessary to ensure that the “important to safety” SSCs provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public
    - The information in this chapter should describe the approach for designating SSC classifications

TICAP – High Level Overview

- TICAP SAR Structure
  - Chapter 6 - Safety-Related Systems, Structures, and Components Criteria and Capabilities
    - The information in this chapter should leverage the analysis performed for the SR SSCs in Chapter 5 of NEI 21-07 and describe in further detail the criteria, capabilities and special treatment of all SR SSCs.
  - Chapter 7 – Non-Safety-Related Special Treatment (NSRST) Systems, Structures, and Components Criteria and Capabilities
    - The information in this chapter should describe the regulatory design and special treatment requirements for SSCs classified as NSRST. NSRST SSCs are relied upon to perform risk-significant functions. Risk-significant SSCs are those that perform functions that prevent or mitigate any LBE from exceeding the F-C target or make significant contributions to the cumulative risk metrics selected for evaluating the total risk from all analyzed LBEs. SSCs considered necessary for ensuring DID adequacy are also categorized as NSRST.

TICAP – High Level Overview

- TICAP SAR Structure
  - Chapter 8 – Plant Programs
    - The information in this chapter should provide information on those plant programs relied upon to provide special treatment to SR and NSRST SSCs that are part of the affirmative safety case. The information should provide an overview of the special treatment programs, addressing the purpose, scope, and performance objectives as well as applicability to SSCs. The information for the programs should provide reasonable assurance that 1) reliability and performance targets are met, and 2) safety-significant uncertainties are addressed. Program areas could include human factors, quality assurance, startup testing, and equipment qualification, among others.

TICAP – High Level Overview

- TICAP - PDC
  - Development of an LMP-based approach for developing proposed PDCs has been a subject of ongoing stakeholder interactions with the most recent occurring at the 12/14 TICAP public workshop
  - Issues discussed include:
    - Applicability of General Design Criteria (GDC) in 10 CFR part 50, Appendix A, including their scope, to non-LWR advanced reactor applicants
    - Additional guidance available to advanced reactor applicants for developing proposed PDC
    - The possible need for exemptions to applicable regulations for proposed PDC developed using the LMP methodology

TICAP – High Level Overview

- Summary of TICAP – PDC Discussions
  - PDC are required to be proposed by applicants for the following:
    - ✓ 10 CFR 50.34(a)(3) for CPs
    - ✓ 10 CFR 52.79(a)(4) for COLs
    - ✓ 10 CFR 52.47(a)(3) for DCs
    - ✓ 10 CFR 52.137(a)(3) for SDAs
    - ✓ 10 CFR 52.157(a) for MLs
  - PDC are a means to meet the requirements of the AEA, Section 182 for inclusion in license applications of *'the specific characteristics of the facility, and such other information as the Commission may, by rule, or regulation, deem necessary in order to enable it to find that the utilization or production of special nuclear material will be in accord with the common defense and security and will provide adequate protection to the health and safety of the public.'*

TICAP – High Level Overview

- Summary of TICAP – PDC Discussions (continued)
  - GDC are applicable to LWRs ("minimum requirements") and "**provide guidance** to applicants for construction permits in establishing principal design criteria **for other types of nuclear power units.**"
  - Advanced Reactor Design Criteria (ARDC) developed by the NRC in RG 1.232 are intended to provide insight into the staff's views on how the underlying safety bases for the GDC could be applied to address non-LWR design features. As noted in RG 1.232, the development of the ARDC was an important first step to address the unique characteristics of non-LWR technology but the NRC recognizes the future benefits to risk-informing the non-LWR design criteria and determining the role of such criteria within a new regulatory framework.

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TICAP – High Level Overview

- Summary of TICAP – PDC Discussions (continued)
  - The NRC position on the requirement for proposed PDC is that it includes the scope of PDC described in the regulations as well as in the regulatory and judicial history.

    The principal design criteria establish the necessary design, fabrication, construction, testing, and performance requirements for structures, systems, and components important to safety; that is, structures, systems, and components that provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public.

  - PDC are particularly important for CP applications since CP applicants are required to provide less information, comparatively speaking, and the information that is provided is preliminary.
  - Proposed PDC play a significant role in supporting the NRC's finding that there is reasonable assurance that safety questions will be satisfactorily resolved and that the proposed facility can be constructed and operated at the proposed location without undue risk to the health and safety of the public.

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TICAP – High Level Overview

- Summary of TICAP – PDC Discussions (continued)
  - Proposed PDC determined to be necessary for a non-LWR design and submitted in an application under 10 CFR Part 50 or Part 52 should be as comprehensive in scope as the GDC and ARDC (i.e., establish the necessary design, fabrication, construction, testing, and performance requirements).
  - Non-LWR applicants proposing PDC that do not fully address the scope of PDC (i.e., design, fabrication, construction, testing, and performance requirements) will need to request exemptions from the applicable regulations.
  - Non-LWR applicants must provide supporting information that justifies to the NRC how their design meets their proposed PDC and how their proposed PDC demonstrate reasonable assurance of safety.
  - NRC believes that it is feasible for applicants for CPs, COLs, DCs, SDAs and MLs to provide justification for an exemption by ensuring that the elements of the PDC scope not fully addressed in their proposed PDC are included in their application.

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TICAP – High Level Overview

- Summary of TICAP – PDC Discussions (continued)
  - TICAP guidance document NEI 21-07 proposed an approach to supplement PDC focused on SR SSCs with proposed Complementary Design Criteria (CDC) that focus on NSRST SSCs.
  - In "fitting" the LMP approach to developing PDC and CDC into the Part 50 and Part 52 regulatory framework, the NRC concluded that both PDC and CDC would need to be relied on the NRC to make its regulatory finding.
  - NRC suggested that a two-tiered PDC approach would comply with the regulations (i.e., PDC Type A for functions performed by SR SSCs and PDC Type B for functions performed by NSRST SSCs).
  - NRC expects further stakeholder interactions at the next TICAP public workshop in January 2022.

Next Steps – Future Milestones

TICAP Near-Term Milestones	Target Date
Update of NRC Draft Guidance Documents	Early December 2021
Continuation of Discussion of NRC draft Exceptions, Clarifications, and Additions (possibility of future draft industry or staff documents)	TBD
NEI 21-07, Revision 1	TBD
Issuance of TICAP draft RG and ARCAP ISG for public comment	Early Calendar Year 2022

TICAP/ARCAP Guidance Document Development

Discussion

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MEETING BREAK

Meeting to resume in 1 hour

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Nuclear Energy Institute / U.S. Nuclear Industry Council Presentation

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Final Discussion and Questions

Acronyms and Abbreviations

ACRS	Advisory Committee for Reactor Safeguards
ADAMS	Agencywide Documents Access and Management System
AEA	Atomic Energy Act
ANS	American Nuclear Society
AOO	Anticipated operational occurrence
ARCAP	Advanced Reactor Content of Application Project
ARDC	Advanced reactor design criteria
ARPS	Advanced reactor policy statement ("Policy Statement on the Regulation of Advanced Reactors;" 73 FR 60612; October 14, 2008)
ASME	American Society of Mechanical Engineers
BDBA	Beyond design basis accident
BDBE	Beyond design basis event
CCFP	Conditional containment failure probability
CDC	Complementary design criteria
CDF	Core damage frequency
CFR	Code of Federal Regulations
COL	Combined license
CP	Construction permit
DANU	Division of Advanced Reactors and Non-Power Production and Utilization Facilities
DBA	Design basis accident
DBE	Design basis event
DC	Design certification
DG	Draft regulatory guide
DID	Defense-in-depth
D-RAP	Design reliability assurance program
EP	Emergency preparedness
EPRI	Electric Power Research Institute
ESP	Early site permit
F-C	Frequency-consequence
FMEA	Failure modes and effects analysis
FR	*Federal Register*
FRN	*Federal Register* Notice
FSAR	Final safety analysis report
FSP	Facility safety program
FTA	Fault tree analysis
GDC	General design criteria

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Acronyms and Abbreviations

HAZOP	Hazard and operability
HFE	Human factors engineering
HRA	Human reliability analysis
HSI	Human-system interface
HTGR	High temperature gas cooled reactor
IAEA	International Atomic Energy Agency
IEFR	Individual early fatality risk
ILCFR	Individual latent cancer fatality risk
ISG	Interim staff guidance
ISI	Inservice inspection
IST	Inservice testing
ITAAC	Inspections, tests, and acceptance criteria
LB	Licensing basis
LBE	Licensing basis event
LERF	Large early release frequency
LMP	Licensing Modernization Project
LMR	Liquid metal cooled reactor
LRF	Large release frequency
LWA	Limited work authorization
LWR	Light water reactor
MCA	Maximum credible accident
MHA	Maximum hypothetical accident
ML	Manufacturing license
MLD	Master logic diagram
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association
NGO	Non-governmental organization
non-LWR	Non-light water reactor
NRC	Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation
NSRST	Non-safety-related special treatment
NUREG	U.S. NRC technical report designation
NWPA	Nuclear Waste Policy Act
OFR	Office of the Federal Register
OL	Operating license
OMB	Office of Management and Budget

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Acronyms and Abbreviations

ONT	Other new technology
P&ID	Piping and instrumentation diagrams
PDC	Principal design criteria
PRA	Probabilistic risk assessment
PRAPS	PRA policy statement ("Use of Probabilistic Risk Assessment Methods in Nuclear Regulatory Activities;" 60 FR 42622; August 16, 1995)
PSA	Probabilistic safety assessment
QHO	Quantitative health objective
RG	Regulatory guide
RIM	Reliability and Integrity Management
RIN	Regulation identifier number
SAMDA	Severe accident mitigation design alternative
SAPS	Severe accident policy statement ("Severe Reactor Accidents Regarding Future Designs and Existing Plants;" 50 FR 32138; August 8, 1985)
SAR	Safety analysis report
SAT	Systems approach to training
SDA	Standard design approval
SECY	Office of the Secretary
SGPS	Safety goal policy statement ("Safety Goals for the Operation of Nuclear Power Plants;" 51 FR 28044; August 4, 1986; as corrected and republished at 51 FR 30028; August 21, 1986)
SMR	Small modular reactor
SNM	Special nuclear material
SR	Supporting requirement (NLWR PRA standard)
SR	Safety-related
SRM	Staff requirements memorandum
SSC	Systems, structures, and components
SSR	Specific safety requirement (IAEA)
STA	Shift technical advisor
TICAP	Technology Inclusive Content of Application Project
TIRIMA	Technology-inclusive, risk-informed, maximum accident
TMI	Three Mile Island
TR	Technical report
TS	Technical specifications

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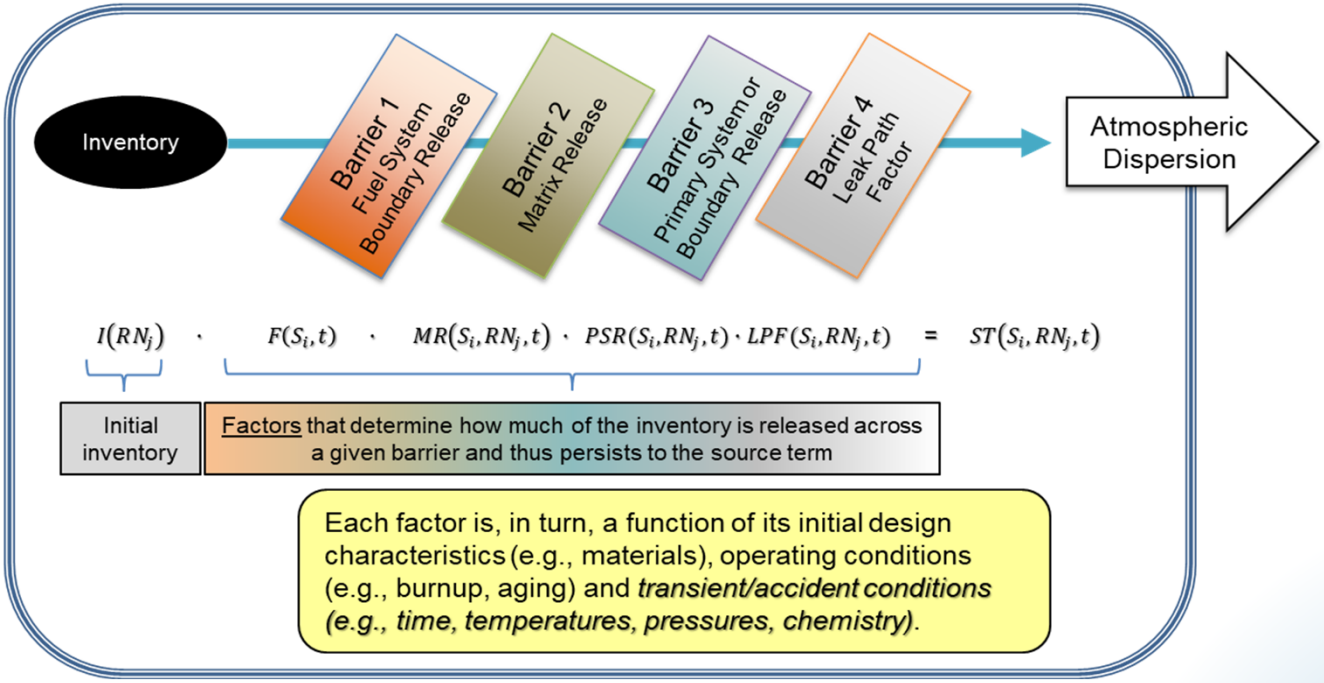
Background Slides

First Principles

Recent NRC activities related to advanced reactors (e.g., functional containment performance criteria, possible changes to emergency planning & security, and DG-1353) recognize the limitations of existing LWR-related guidance, which requires a return to first principles such as fundamental safety functions supporting the retention of radionuclides



See: SECY-18-0096, "Functional Containment Performance Criteria for Non-Light-Water-Reactors," and INL/EXT-20-58717, "Technology-Inclusive Determination of Mechanistic Source Terms for Offsite Dose-Related Assessments for Advanced Nuclear Reactor Facilities"

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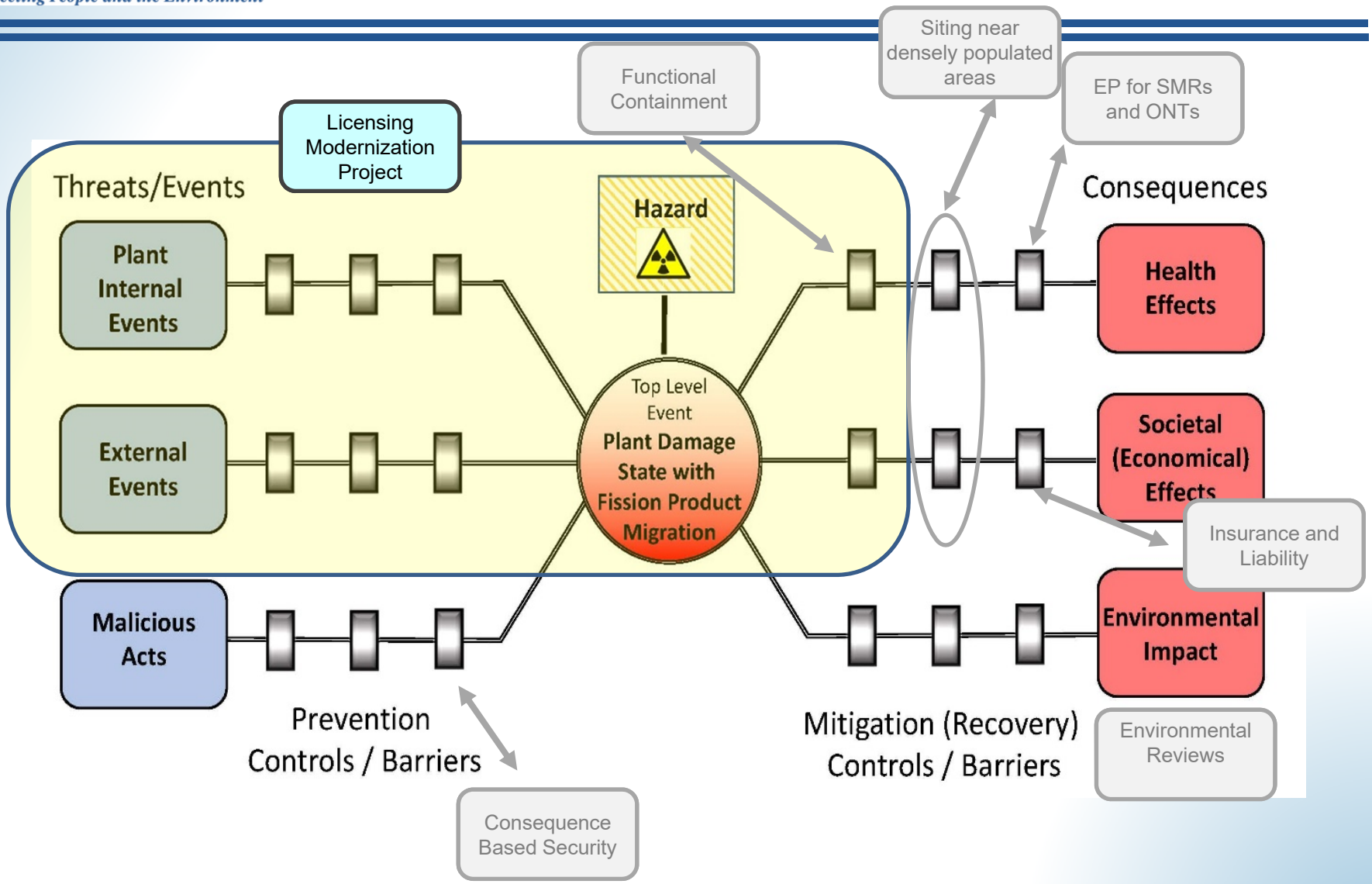
Integrated Approach



Background

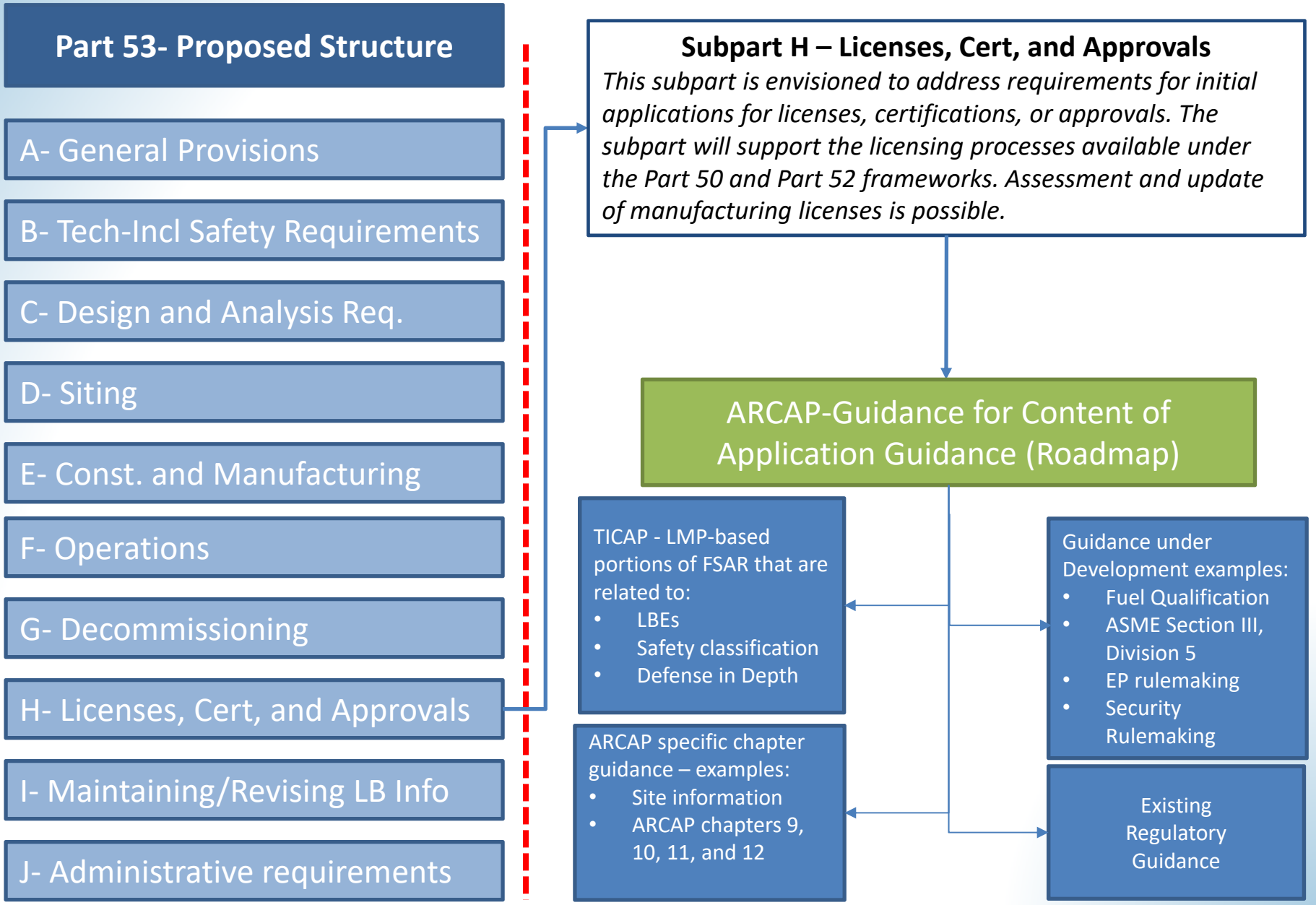
- Nuclear Energy Innovation and Modernization Act (NEIMA; Public Law 115-439) signed into law in January 2019 requires the NRC to complete a rulemaking to establish a technology-inclusive, regulatory framework for optional use for commercial advanced nuclear reactors no later than December 2027
  - (1) ADVANCED NUCLEAR REACTOR—The term "advanced nuclear reactor" means a nuclear fission or fusion reactor, including a prototype plant… with significant improvements compared to commercial nuclear reactors under construction as of the date of enactment of this Act, …

Severe Accidents

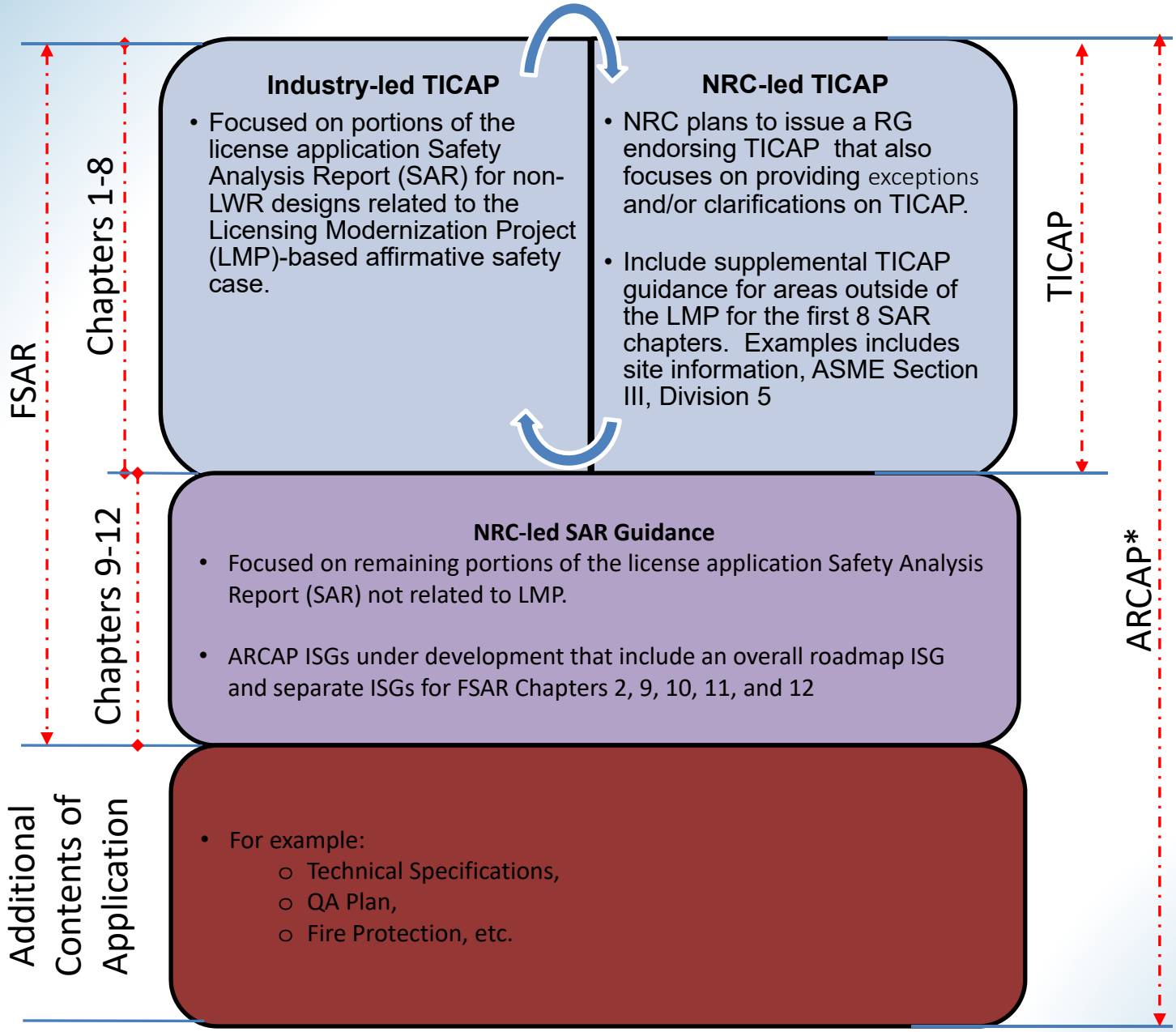
- Severe Accident Policy Statement
  - Although in the licensing of existing plants the Commission has determined that these plants pose no undue risk to public health and safety, this should not be viewed as implying a Commission policy that safety improvements in new plant designs should not be actively sought. The Commission fully expects that vendors engaged in designing new standard (or custom) plants will achieve a higher standard of severe accident safety performance than their prior designs.
- 10 CFR 52.47(a)(23)
  - For light-water reactor designs, a description and analysis of design features for the prevention and mitigation of severe accidents, e.g., challenges to containment integrity caused by core-concrete interaction, steam explosion, high-pressure core melt ejection, hydrogen combustion, and containment bypass
- NUREG-1226 (Development and Utilization of the NRC Policy Statement on the Regulation of Advanced Nuclear Power Plants; Executive Summary)
  - (4) While the Final Policy Statement encourages innovative reactor designs and safety criteria, the review of advanced reactor designs will still require satisfactory consideration of the Commission's regulations, regulatory guides and other guidelines, such established and developing criteria as the defense-in-depth philosophy, standardization, the Commission's safety goal and severe accident policies, and applicable industry codes and standards.

Backup Slides

Technology-Inclusive Content of Application (TICAP) and Advanced Reactors Content of Application (ARCAP)- Nexus to Part 53



Note: The illustrated content structure for Part 53 (including Subpart H) is part of ongoing work and subject to change.



*Staff plans to issue an ARCAP Roadmap ISG that would provide pointers to various guidance documents developed/issued.

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Key Part 53 Guidance by Subpart

Subpart A: General Provisions	
Existing / Ongoing Guidance	Additional Guidance
N/A	
Subpart B: Safety Criteria	
Existing / Ongoing Guidance	Additional Guidance
N/A	▪ Further explanation of criteria and structure in the Statements of Consideration
Subpart C: Design and Analysis	
Existing / Ongoing Guidance	Additional Guidance
▪ NEI 18-04 & RG 1.233 (LMP) ▪ ANS/ASME-RA-S-1.4 (Non-LWR PRA Standard) ▪ Industry PRA Peer Review Guidance for Non-LWRs (NEI 20-09) ▪ ANS/ASME Standards (ASME III-5, ASME XI-II) ▪ Fuel Qualification (NUREG-2246) ▪ RG 1.232 (ARDCs)	▪ ISG on PRA for Initial Licensing ▪ RG 1.247 Endorsing Non-LWR PRA Standard and NEI Peer Review Guidance ▪ Application of Analytical Margins ▪ Treatment of Chemical Hazards
Subpart D: Siting Requirements	
Existing / Ongoing Guidance	Additional Guidance
▪ SECY-20-0045/RG 4.7 ▪ External Hazard Updates ▪ Risk-Informed Seismic Design; ANS 2.26	N/A

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Key Part 53 Guidance by Subpart

Subpart E: Construction and Manufacturing	
Existing / Ongoing Guidance	Additional Guidance
N/A	▪ Manufacturing Guidance ▪ QA Alternatives
Subpart F: Operations	
SSCs	
Existing / Ongoing Guidance	Additional Guidance
▪ NEI 18-04 & RG 1.233 (LMP)	▪ Technical Specifications ▪ Special Treatment ▪ Maintenance, Repair & Inspection ▪ Facility Safety Program
Personnel	
Existing / Ongoing Guidance	Additional Guidance
▪ DRO Paper/preliminary ISG	▪ Concept of Operations
Programs	
Existing / Ongoing Guidance	Additional Guidance
▪ EPZ Draft Final Rule, RG 1.242 ▪ Radiation Protection (ARCAP)	▪ Emergency Preparedness ▪ Security Programs (e.g., FFD, Access Authorization, Cyber Security) ▪ Integrity Assessment Program

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Key Part 53 Guidance by Subpart

Subpart G: Decommissioning	
Existing / Ongoing Guidance	Additional Guidance
N/A	N/A
Subpart H: Licensing	
Existing / Ongoing Guidance	Additional Guidance
▪ TICAP ▪ ARCAP	▪ Manufacturing Licenses
Subpart I: Maintaining Licensing Basis	
Existing / Ongoing Guidance	Additional Guidance
N/A	▪ 50.59 Equivalent ▪ FSAR/PRA Updates
Subpart J: Administrative/Misc.	
Existing / Ongoing Guidance	Additional Guidance
N/A	▪ Reporting Requirements ▪ Financial/Liability

Part 53 Rulemaking: Industry Perspectives

ACRS Future Plant Subcommittee
December 17, 2021

Marc Nichol, NEI
Senior Director, New Reactors

Cyril Draffin, USNIC
Senior Fellow, Advanced Nuclear

Agenda

- Risk-Informed Licensing Approaches (NEI) 11:45 AM
  - QHOs
  - PRA
  - September white paper

Lunch 1:00 PM

- Standards and Atomic Energy Act (USNIC) 2:00 PM

- Increasing Regulatory Burden without Commensurate Safety Increase (NEI) 2:20 PM
  - ALARA design requirement
  - BDBE in design basis
  - Redundant Programs

- Improving Clarity and Efficiency (USNIC) 3:10 PM
  - Technology-inclusive
  - Goals for Regulatory Efficiency
  - Similar ACRS and Industry Input

- Adjourn 3:50 PM

Risk-Informed Licensing Approaches

Marc Nichol, NEI

Risk-informed Licensing Approaches

Overview of Industry Goals for Part 53

- Usefulness
  - All licensing approaches are viable
  - Less burdensome over the lifecycle of activities
  - Guidance will be important to explain how to meet the regulation
- Risk-Informed
  - NRC PRA policy statement: use of PRA to the extent it is practical
  - Part 53 should allow a variety of roles and uses of the PRA
  - Allow for both “leading” and “confirmatory/supporting” roles
  - Primary expectation is that decisions are informed by the use of a PRA
  - In some cases alternatives to a PRA may provide equivalent benefits

Industry Concerns on Part 53 Rule Language

Subsequent slides present details of industry's perspective on these concerns

1. NRC has stated that performance-based design requirements are not dependent on how PRA is used, but…

   NRC has stated that only LMP and other methods using PRA in a "leading role" can use Part 53

2. NRC has stated that use of PRA in "leading role" is required because QHOs are in the rule, but…

   NRC has not explained why QHOs must be in the rule

3. NRC has stated they are developing Part 5X in response to industry's request to use other risk-informed approaches, but…

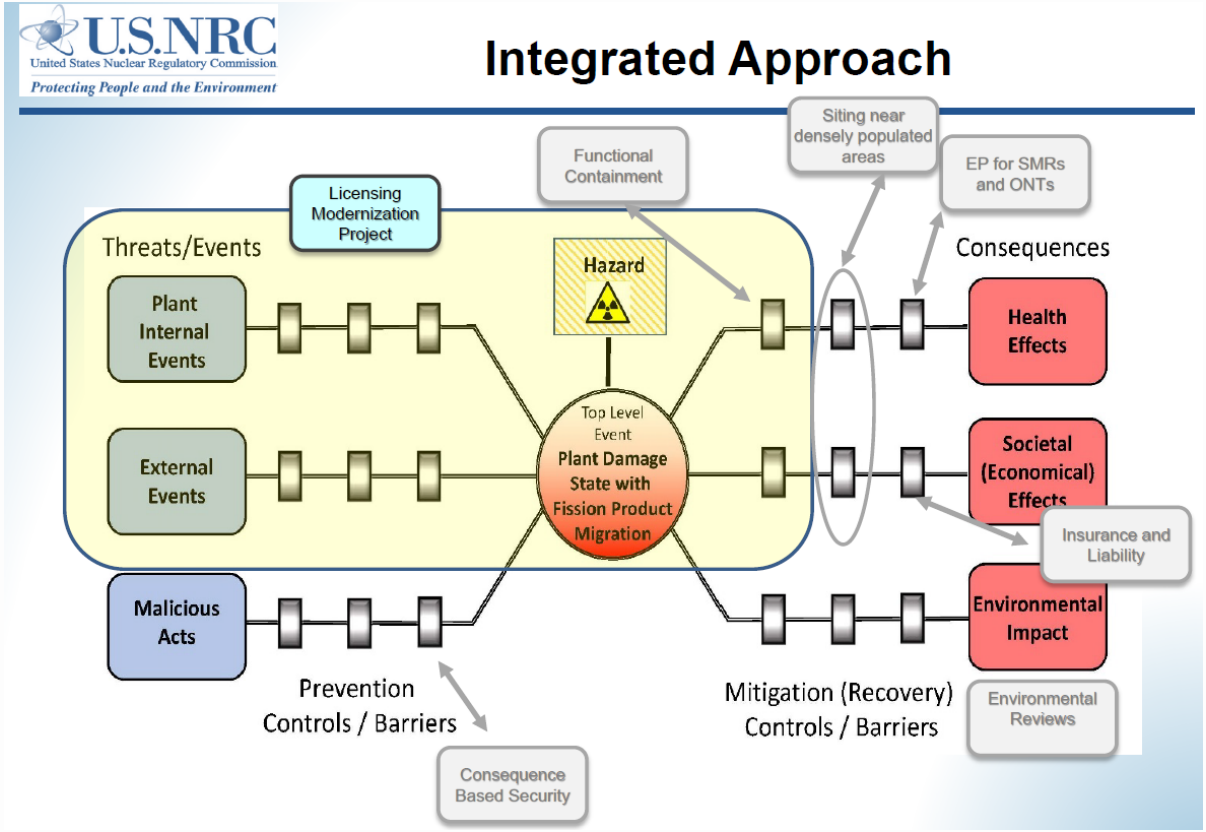
   Industry has requested straightforward changes to Part 53 to accomplish this goal, and industry did not ask for a parallel Part 5X

Benefits of Part 53

Why Part 53 benefits should be available for all risk-informed licensing approaches

- Benefits of Part 53 – performance-based design requirements
  - All requirements are focused back to their relevance to safety criteria
  - Integrated framework of design requirements (see NRC's graphic on next slide)
  - Performance-based acceptance criteria (examples):
    - 53.210 – "{dose} to individual…at EAB {will not exceed} 25 rem TEDE" {for DBA}
    - 53.230 – "primary safety function is limiting release of radioactive material…additional safety functions…must be defined"
    - 53.240 – "LBEs must be identified…must address combinations of malfunctions…human errors…external hazards…{ from AOO to very unlikely}"
    - 53.400 – "design features must be provided {that}...satisfy the safety criteria"
    - 53.410 – "FDC must be defined…to demonstrate compliance with safety criteria"
- We agree with NRC that Part 53 performance-based requirements for plant design are not dependent on how PRA is used

NRC's Integrated Framework



Risk-informed Approach Desired by Industry

Why Part 53 must be inclusive in how PRA is used in the design and analysis

- NEI/USNIC has been asking for a rule that accommodates all risk-informed approaches since mid-2020
  - We wanted Part 53 requirements to be more inclusive, with guidance to address details where necessary
  - We did not want multiple parallel frameworks of requirements in order to enable flexibility
  - Currently Part 50 and 52 requirements achieve inclusiveness through a single design/analysis framework without a reduction in predictability
  - We believe NRC should establish criteria that demonstrates safety, and does not need to require specific methods for design and analysis
- We do not agree with the NRC that only LMP and other methods using PRA in a “leading role” should be able to use Part 53

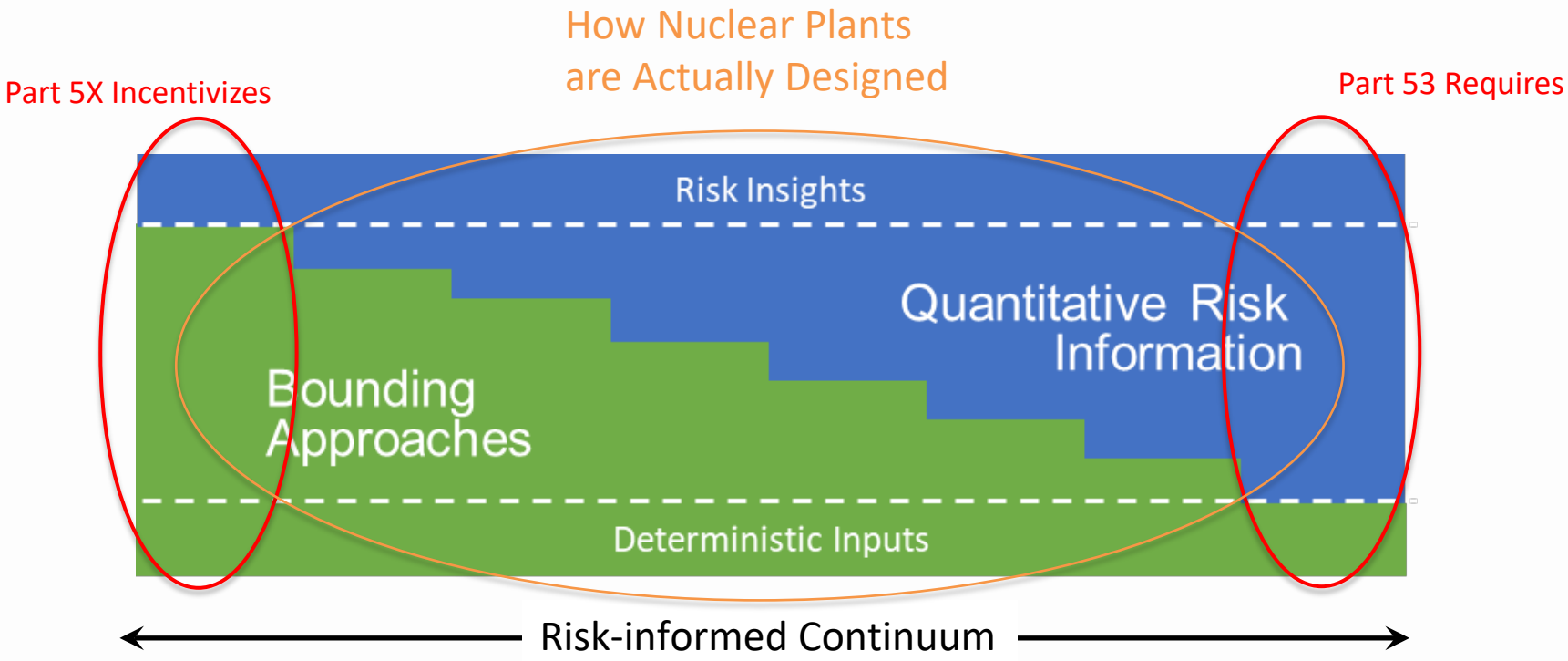
Accomplishing Risk-informing

Benefits of Risk-informing

- Integrated approach of PRA complements deterministic
- Characterize the overall residual risks of a design
- Can help focus on issues of safety significance
- Should yield greater operational flexibility after licensing

Spectrum of Risk-informed Approaches

Parts 53 and 5X don't align with how plants are actually designed and analyzed



NEI September 2021 Paper

"Technology-Inclusive, Performance-Based and Risk-Informed Approaches for Assessing the Safety Adequacy of the Design for Part 53"

- Goals:
  - Advance discussion of how different approaches may fit under Part 53
  - More clearly illuminate the role of PRA and risk information
- Approach:
  - Establish an inclusive framework of principles for a sufficient safety case
  - Build on elements of a TI-RIPB process for assessing safety adequacy
  - Present four examples across the spectrum of potential approaches
  - Demonstrate how each example meets the guiding principles
  - Each example has a different balance between deterministic safety analyses and risk information in what is always a risk-informed process

Key Elements of Part 53 Addressed

- Limits for protecting the public health and safety
- Safety functions
- Licensing basis events
- Defense-in-depth
- Design features
- Functional design criteria
- Safety categorization

Notes

- The paper does not imply an endorsement of the NRC preliminary rule text, but acknowledges that these key elements are important to the safety case
- Other Part 53 elements are important to the licensing basis, but are not included since they do not have a primary effect on the TI-RIPB process
- It is envisioned that the TI-RIPB process in the paper will inform future changes to the Part 53 requirements

Principles for TI-RIPB Process

1. The plant meets the established limits for the adequate protection of the public health and safety.
2. The safety functions, design features and functional design criteria relied upon to meet the safety criteria are established.
3. The systematic selection of LBEs adequately cover the range of hazards that a specific design is exposed to.
4. The SSCs are categorized according to their safety significance.
5. The design reflects the application of an appropriate philosophy of defense-in-depth.
6. The special treatment for SSCs, and associated programmatic controls and human actions, provide reasonable assurance that the SSCs will perform the safety functions for which they are relied upon.
7. The scope and level of detail for the design and analysis of the plant in the licensing basis information adequately describes the safety case. *(Not addressed at this time)*

Examples of Risk-Informed Licensing Approaches

- Four Examples evaluated
  - A: Licensing Modernization Project (NEI 18-04)
  - B: NEI 18-04 with PRA in a complementary role
  - C: Approach compatible with IAEA safety standards
  - D: Bounding Analysis
- Conclusions:
  - All utilize PRA, some use it a little, some use it a lot
  - Use of the PRA in all examples is able to demonstrate safety
  - All can meet Part 53 design requirements, and less prescriptive versions of the PRA requirements
  - All can utilize the Frequency-Consequence curve
  - Specific use of PRA is related to how the designer wishes to approach the design and analysis of the plant

Safety Criteria and QHOs

There has been little discussion of whether QHOs are more appropriate in Policy or the Rule

- NRC has said QHOs must be in the rule, and asked “if not the QHOs, then what?”
  - This is the wrong way to frame the consideration of QHOs and BDBE
- The right framing is “why should QHOs be in the rule”?
  - QHOs have been in Policy Statement for decades, and BDBE is addressed by mitigation requirement
  - What problem is solved by having QHOs in the rule?
  - Are there benefits to QHOs in the rule?
  - Are the disadvantages and risks, of QHOs in the rule, reasonable and being mitigated?
- The NRC has not provided a basis for having QHOs in the rule
  - We provided an assessment of QHOs in rule vs. Policy Statement as early as January 2021, but did not receive any feedback from NRC

Quantitative Health Objectives (1/3)

Industry's Evaluation of advantages/disadvantages of putting QHOs in the rule

Advantages	Disadvantages
1. Enhances regulatory stability by making it harder for the NRC to change the limits, or make arbitrary judgements.	1. Increases regulatory uncertainty by establishing requirements without specifying the consequence limits (i.e., dose for immediate fatalities and latent cancers).
2. Enhanced clarity by providing specific limits of acceptable risk to the public for beyond design basis events (BDBEs).	2. Reduces regulatory stability since changes to the consequence limits (i.e., risk for immediate fatalities and latent cancers) will now be regulatory limits instead of policy goals.
3. Ensures that regulations explicitly result in risk levels that comply with the QHO limits.	3. Is counter to Commission's intent that the QHOs are goals, and not limits.
4. The QHOs are more understandable to the public because they are expressed in terms of public health effects.	4. Not having consequence limits, and the complexity of demonstrating the QHOs are met, increases licensing risk.
5. The QHOs are the maximum acceptable consequences, and therefore avoid more conservative surrogate requirements.	5. Changes to societal risks can result in changes to the requirements that can force changes to the facility design.
6. Potential to eliminate the need for some other requirements (e.g., mitigation of beyond design basis events).	6. Analyses and calculations related to demonstrating the QHOs are met are now used for legal compliance with requirements.
	7. Risks a revision to the QHOs. The NRC discontinued its efforts circa 2000 to update the safety goals so that improvements can be more significant and incorporate experience with risk-informed decision making.

Quantitative Health Objectives (2/3)

QHOs in the rule do not improve safety, but do create complications

- Safety is the same whether QHOs are in Rule language or the Policy statement
  - Both approaches demonstrate that design meets the QHOs
  - The applicant's design and analysis are the same
  - The NRC scope of review is the same
- The difference is in the legal compliance
  - QHO in policy statement: staff confirm applicant's conclusions that QHOs are met
  - QHO in rule: applicant must demonstrate legal compliance, subject to hearing contention
- NRC stated that QHOs in the rule requires a "leading" PRA approach
- QHOs in the rule is not an evolution of the PRA Policy Statement, but far exceeds the envisioned application of them (SECY 89-102):
  - Evaluate adequacy of requirements to achieve acceptable risk to the public
  - Objectives not to be used as requirements, but useful as basis for guidance
  - Useful, in a generic sense, in making regulatory decision for an application

Quantitative Health Objectives (3/3)

Industry's Proposal for QHOs in Part 53 to Achieve acceptable risk to the public

- Apply consistent with the Safety Goal Policy Statement
- Ensure requirements achieve acceptable risk to the public
  - Dose to the public less than 1 rem (§ 53.260)
  - Occupational exposures less than 5 rem (§ 53.270)
  - Anticipated Operational Occurrences: can set 1 rem limit (if necessary)
  - Design Basis Accidents, dose less than 25 rem (§ 53.210)
  - Beyond Design Basis events: Mitigation similar to 10 CFR 50.155 (§ 53.220)
  - Establish requirements for systematic search for events (§ 53.240, 53.450)
- Inform basis for guidance to establish risk-based metrics
  - Can use QHOs directly for comparison (as in LMP)
  - Can use QHOs to develop surrogates (e.g., core damage frequency)

Performance-Based Requirements for PRA

Why NRC prescriptive use of PRA in the Rules is not necessary

- NRC Part 52 requirement:
  - Applicants to provide a description of the plant-specific PRA and its results.
- Practical use of the PRA in Part 52:
  - Identify and address potential design and operational vulnerabilities (e.g., assumed individual or common-cause failures could drive plant risk to unacceptable levels with respect to the Commission's goals)
  - Demonstrate how risk compares against the Commission's Policy Goals (e.g., QHOs)
  - Demonstrate whether RTNSS is sufficient
  - Support regulatory oversight
  - Support development of specifications for ITAAC, TS, etc.
  - Scope: Level 1 and 2 including internal and external events and all modes
  - Risk insights: SSC most effective at reducing risk, major contributors of risk and uncertainty

Prescriptive Requirements for PRA

Why NRC prescriptive use of PRA in the Rules is not necessary

- NRC Part 53 PRA requirements (red are not in Part 50/52 rule language):
  - Consider events that challenge plant control and safety (internal and external)
  - Conform with generally accepted methods
  - Be maintained and upgraded every two years
  - Identify potential failures, degradation mechanisms, susceptibility to internal and external hazards, other contributing factors to unplanned events that might challenge safety functions
  - Determine licensing basis events
  - Used for classifying SSCs and human actions according to safety significance, and environmental conditions
  - Evaluate adequacy of defense-in-depth measures
  - Assess all plant operating states where there is a potential for uncontrolled release

Industry Proposed Requirements for Part 53

Why NRC prescriptive use of PRA in the Rules is not necessary

- Performance-based analysis requirements:
  - Analyses of licensing basis events must be performed
  - Must systematically identify event sequences from initiation to safe stable end state
  - Must demonstrate compliance with safety criteria
  - May perform a single of multiple bounding analyses
- Performance-based PRA requirement:
  - Must perform PRA to incorporate risk insights into the design, as appropriate
  - PRA completeness commensurate with completeness of design
  - Be maintained and upgraded every four years
- Performance-based requirements achieve same outcome as NRC's prescriptive requirements (e.g., rigor, confidence)
  - They are also inclusive to accommodate all roles of the PRA

NRC's Prescriptive Requirements for PRA

Concern that NRC will require more of the PRA to be submitted as part of licensing basis

- Industry concern has been that QHOs in the rule and more prescriptive PRA requirements will lead to NRC requiring more of the PRA to be submitted in the licensing basis
- NRC stated at December 9, 2021 Commission briefing, that it is not their intent to require the PRA to be submitted to and reviewed by the NRC
  - We support this intention and do not think the PRA should be part of the licensing basis, but is available for NRC inspection
- However, the preliminary rule language and staff statements have not reflected this intention
  - 53.1185: "The SAR must include…an analysis of {*all*} LBEs…to determine compliance with…53.220 {*QHOs*}…must address elements in 53.450(e) and (f) {*PRA requirements*}"
  - NRC statement at 5/27/21 meeting that NRC would need to review PRA
  - NRC's endorsement of TICAP must include more PRA details (e.g., reliability and capability targets for SSCs)

A Part 53 Inclusive of All Licensing Approaches

Why pursuit of Part 5X is not necessary, inefficient and increasing confusion

	NRC's Approach	Industry's Proposal
Approach to include all risk-informed approaches	Two+ Rigid frameworks (53, 5X, maybe MA)	Single inclusive framework (Part 53)
Proposal for Part 53	Only allowed for LMP and leading PRA role	Straightforward changes to QHO and PRA requirements to allow all risk-informed approaches
Proposal for Part 5X	80%-90% of Part 50/52 requirements, attempt to make tech-inclusive	Delete and abandon
Proposal for TIRIMA	Considering whether to include	Potential use for guidance, may need exemptions to Part 53
Level of effort and clarity	Significant effort needed, complex and confusing	Very little effort needed, clear and straightforward

- NRC should revise Part 53 to be inclusive of all risk-informed approaches, abandon Part 5X
- Industry is developing guidance that would implement the inclusive Part 53 recommended in 11/5/21 comments

Standards and AEA

Cyril Draffin, USNIC

Standards and AEA – NRC Iterations

Standards in statutory requirements in Atomic Energy Act

- Section 182, *"adequate protection to the health and safety of the public"*
- Section 161, "*to protect health or to minimize danger to life or property.*"

NRC 1st iteration of preliminary rule language established the AEA statutory standards identified above as basis for Part 53 (ML20311A004) for 53.200

NRC 2nd & 3rd iteration of preliminary rule language reduces regulatory clarity

- Current version replaces AEA language with different safety standards that do not clearly relate back to the AEA and have no regulatory precedent
- 53.200, *"limit the possibility of an immediate threat to the public health and safety"* and "*considering potential risks to public health and safety*"

Standards and AEA – NRC Perspective – written (in NRC Discussion of 2nd Iteration of Subpart B, § 53.200 Safety Objectives)

"The change is to revise the first objective from providing "reasonable assurance of adequate protection" to limiting "the possibility of an immediate threat to the public health and safety." This language generally aligns with standards the Commission has used for determining the content of technical specifications. The change also revises the second objective from "protect public health and minimize danger" to "as may be appropriate when considering potential risks to public health and safety." The purpose of these objectives is clarified by adding the statement that they will be carried out by meeting the safety criteria identified in this subpart (§§ 53.210 and 53.220).

This change resulted from stakeholder comments and internal NRC discussions regarding the difficulties in using the Atomic Energy Act (AEA) Sections 182 and 161 authorities as the safety objectives for part 53, and in turn as the bases for the two-tier safety criteria framework. Instead, the use of "adequate protection" is expected to be used in its traditional role as an NRC regulatory finding, which is presumed through compliance with NRC regulations including part 53 or other license requirements. While Sections 182 and 161 of the AEA will be cited as enabling legislation within the rule package (e.g., in the Federal Register Notice), the staff does not foresee incorporating language from the AEA into the safety objectives or tiers in part 53."

Standards and AEA – NRC Perspective -verbal

During public meeting discussing change in safety objectives, NRC staff explained that because entirety of Part 53 satisfies the AEA, AEA standards do not need to be referenced in Part 53, and NRC thus should establish new standards to frame the Part 53 requirements.

Standards and AEA – Observations

NRC change seemed to be in support of two tier structure – that has now been dropped responsive to ACRS and Industry comments

NRC refers to stakeholder input

Approach inconsistent with longstanding practice of NRC and appears to reject decades of Commission precedent, with no compelling benefit or indication of Commissioners' approval

Standards and AEA – Concerns with 3rd Iteration

New approach requires extra resources

- NRC would need to invest significant resources in defining these new standards, to ensure consistency with the AEA

New approach reduces regulatory clarity and efficiency

- No clear connection between the Part 53 requirements and the AEA safety standards.
- No equivalent in Parts 50 and 52, no regulatory precedent

Could greatly expand NRC's regulatory control beyond what is in place for existing reactors without increase to safety

- Appears to be regulatory overreach that contravenes longstanding safety policy embraced by the Commission for decades consistent with safety standards established by AEA
- No explanation on what new safety standards mean, how they can be met, or how they relate to all requirements in Part 53

Standards and AEA – Lack of Clarity

Lack of clarity on how requirements relate back to AEA safety standards

- Even after decades of implementing standard of “adequate protection” NRC had to issue multiple recent memos to staff to avoid misapplication of this standard in application reviews (ML19015A290, ML18240A410, and ML19260E683)
- Such challenges will be exacerbated in Part 53 if it introduces new standards rather than providing clarity on how requirements relate back to AEA standards

NRC should utilize the safety standards from the AEA, as done in 1st iteration, rather than creating new standards (2nd/3rd iterations)

Increasing Regulatory Burden without Commensurate Increase in Safety

Marc Nichol, NEI

Achieving Safety More Efficiently

Overview of Industry Goals for Part 53

- Usefulness
  - Less burdensome over the lifecycle of activities
  - Performance-based requirements with clear/objective acceptance criteria
  - Guidance will be important to explain how to meet the regulation
- Efficiency
  - Achieve equivalent level of safely more efficiently than Parts 50 and 52
  - Reduced cost and schedule in licensing and oversight
  - Do not include requirements that Part 50/52 have shown are not needed to protect the public
  - Do not include new requirements that are not needed to protect the public
- Recognize confidence in licensee controls
  - NRC imposes requirements that are effective even after the NRC issues a license
  - Licensee is competent in fulfilling their responsibility to meet programmatic requirements
  - NRC oversight and inspection to ensure compliance

Industry Concerns on Part 53 Rule Language

Subsequent slides present details of industry's perspective on these concerns

- ALARA design requirement
- BDBE in design basis
- Proliferation of Redundant and unnecessary Programs
- Facility safety program

As-Low-As Reasonably Achievable (1/3)

NRC including design requirement, beyond the currently requirement program requirement

- Part 53 doesn't need to have any requirement for ALARA
  - Part 20 ALARA requirements will still apply
- Part 20 Requirements on ALARA, Subpart B (20.1101):
  - Must use, to the extent practical, procedures and engineering controls to achieve ALARA
  - Must implement an RP program to ensure compliance with Part 20, including achieving ALARA
  - No requirement for design to consider ALARA
- NRC's Part 53 requirement for ALARA is clearly expanding to include design :
  - 53.260(b): "Design features and programmatic controls must be established such that the TEDE…are ALARA in accordance with Part 20"
  - 53.270(b): "As required by Subpart B of Part 20, design features and programmatic controls, to the extent practical, be based on RP principles to achieve occupational doses that are ALARA."

As-Low-As Reasonably Achievable (2/3)

- ALARA design requirements not consistent with past Commission decisions*
  - "the ALARA concept is intended to be an operating principle rather than an absolute."
  - ALARA can be achieved solely through the implementation of the licensee's radiation protection program, required by Part 20
  - "expressly intended that the level of this program and efforts to document it are commensurate with the size of the licensed facility and the potential hazards from radiation exposure and the intake of radioactive materials."
- ALARA as a design requirement increases regulatory burden without a safety benefit
  - No practical endpoint for additional measures, and it is left to negotiation between the NRC and the designer as to how much is good enough
  - Addressing ALARA through programs has been effective for decades
  - Inconsistent with the development of more risk-informed, performance-based and efficient regulatory framework for advanced reactors

*See: Standards for Protection Against Radiation; Final Rule, 56 Fed. Reg. 23359, 23366, 23367 (May 21, 1991)

As-Low-As Reasonably Achievable (3/3)

- NRC stated in December 9, 2021 Commission briefing on Part 53
  - Not intent to elevate ALARA as a design requirement
  - Perhaps more of an “option” during the design, provides flexibility
- Part 53 requirements do not achieve NRC intention
  - 53.260(b) and 53.270(b) require design features and programmatic controls for ALARA, they don’t allow an option
- It is unclear how an option for ALARA design requirement would work
  - If applicant meets requirements for design to achieve ALARA, would they not be required to consider ALARA in their radiation protection program?
  - Who would want to meet a voluntary design requirement for ALARA if they are still required to meet ALARA in RP program?
  - Without ALARA design requirement: Developer can still optimize design for addressing ALARA in RP program.
  - What flexibility does an ALARA design requirement provide?
- Best solution is to delete the ALARA requirement from Part 53

Beyond Design Basis in the Design Basis

NRC expanding requirements for BDBE

- NRC stated in December 9, 2021 Commission briefing on Part 53
  - Part 53 benefit is more up front *{BDBE requirements}*, downstream flexibility
  - Not intent to include BDBE in design basis
  - Treated the same as today, BDBE doesn't need to rely on safety-related SSCs
- Part 50/52 requires mitigation for BDBEs – 10 CFR 50.155
- Part 53 requirements do not achieve NRC's intentions
  - Part 53 requires mitigation for BDBE's in 53.450(g)(3)
  - Part 53 <u>also</u> establishes requirements for BDBE design through QHOs in the rule
    - 53.400 requires design features to meet 53.220
    - 53.420 requires functional design criteria to meet 53.220
    - 53.440 establishes design requirements to meet 53.220
    - 53.460 requires special treatment for NSRST similar to SR to meet 53.220
    - 53.220 includes BDBE through QHOs in the rule
- Part 5X also includes BDBE in design basis

Beyond Design Basis in the Licensing Basis

BDBE in design basis is inconsistent with Commission decisions to treat through mitigation

- Commission directed the staff to remove design requirements for BDBE for new reactors in the Proposed Rulemaking for Mitigation of Beyond Design Basis Events in SRM-SECY-15-0065 (ML15239A767).
  - Commission recognized the NRC ability to provide oversight for mitigation
- Commission specifically noted that requirements should not establish a separate standard for new reactors
  - "A more flexible approach for new reactor applicants [mitigation] is preferred"
- Advanced reactor policy statement has led to designs with reduced reliance on human actions
  - "this rule allows an applicant for a new reactor license…to provide innovative solutions to address the need to effectively prioritize event mitigation and recovery actions"
  - "regulatory requirements should not impose unnecessary burden or divert attention from more important safety objectives"

Beyond Design Basis in the Licensing Basis

Industry's proposal for a more technology-inclusive mitigation requirement

- Keep QHOs in Policy, do not include in rule, since they drive the BDBE design basis requirements,
- Replace 53.220 with the following (technology-inclusive version of 50.155):

  For BDBEs, each applicant or licensee shall develop, implement, and maintain mitigation strategies and guidance that are capable of being implemented site-wide and must include the following:

  (a) The capability to maintain or restore the safety functions necessary to meet the safety criteria in 53.210.

  (b) The acquisition and use of offsite assistance and resources to support the functions required by paragraph (a) of this section indefinitely, or until sufficient site functional capabilities can be maintained without the need for the mitigation strategies

  (c) Strategies and guidance to provide the capabilities in (a) under the circumstances associated with loss of large areas of the plant impacted by the event, due to explosions or fire, to minimize radiological releases.

Operational Programs

Overview of industry's perspective

- NRC's prior assertions that: increased design and analysis burden would lead to a reduction in operational burden does not appear accurate
- NRC needs to reassess the program requirements in Part 53
  - 11 program areas have equivalents in Part 50/52
  - 13 program areas do not have a Part 50/52 equivalent or duplicate others
  - Over 20 instances of open ended requirements for "programmatic controls"
- NRC needs to establish a regulatory philosophy for Part 53 that defines the regulatory purpose of programs
  - Having clarity on why programs are needed will ensure that the program requirements are efficient
- NRC should ensure needed programs are performance-based, graded and appropriately scoped with entry criteria
  - Some programs (with Part 50/52 equivalents) are more burdensome, without increasing safety, than Parts 50/52

Evaluating NRC Proposed Part 53 Programs

Programs with a Part 50/52 Equivalent

Required in NRC Part 53 Preliminary Language	Part 50/52 Equivalent Requirements
53.710(a)* - Initial Startup Testing	50.34(b)(6(iii)
53.870 Inservice Inspection/Inservice Testing	50.55a
53.730 Maintenance, repair, and inspection programs	50.65 - although some elements may not have Part 50/52 counterpart
53.720 Maintaining capabilities and availability of SSCs	50.36 and 50.69
53.710(b)* - Training (Expected in future Subpart F requirements on human actions)	50.2, Part 55, 50.120
53.710(c)* - Operating Plans (Expected in future Subpart F requirements on human actions)	50.34(b)(6)(iv and v)
53.860 Fire Protection	50.48
53.810 Radiation Protection	Part 20
53.820 Emergency Preparedness	50.47 or 50.160 (in development)
53.830 Security Programs	Part 73 (73.54, 73.55, 73.56) and Part 26
53.550 Environmental Considerations – Points to Part 51	50.36b – Points to Part 51 (if applicable)

*Note that at the time this slide was developed the NRC has not yet released the Subpart F regulations for human actions, which could include duplicative requirements

Evaluating NRC Proposed Part 53 Programs

Programs that duplicate the Quality Assurance Program

Required in NRC Part 53 Preliminary Language	Part 50/52 Equivalent Requirements
53.840 Quality Assurance	Most of Appendix B QA Program
53.480 Design Control Quality Assurance	None - Duplicates QA Program
53.610(a)(1&7) and 53.620(a)(1&6) Construction and Manufacturing Quality Assurance	None - Duplicates QA Program
53.490 Design and Analyses Interfaces	None - Duplicates QA Program
53.740 Design Control	None - Duplicates QA Program
53.620(b)(1)(IV)(vii) – Manufacturing, Manufacturing Activities	None - Duplicates QA Program

- NRC should eliminate requirements that duplicate the QA Program
- NRC should put all of the QA Requirements together similar to Appendix B
  - Preserve the ability to use Appendix B QA program for those that wish to
  - Enable the use of ISO-9001 and other commercial QA standards
- NRC does not need to specify QA requirements for non-safety-related but safety significant SSCs

Evaluating NRC Proposed Part 53 Programs

NRC Required Programs without any Part 50/52 equivalent

Required in NRC Part 53 Preliminary Language	Part 50/52 Equivalent Requirements
53.700 Operational Objectives	None – Duplicates most other operational programs
53.800 Operational Programs	None – Duplicates most other operational programs
53.850 Integrity Assessment Programs	None – Duplicates Maintenance, ISI/IST, Technical Specifications, and creates an aging management program from Day 1
53.890, 53.892, and 53.894 Facility Safety Program, Criteria and Plan	None – Duplicates other programs, codifies periodic safety review, and circumvents backfit protection
53.880 Criticality Safety Program	None – Not necessary to require a program for compliance with each requirement. 50.68 is a better model for Part 53 requirement.
53.610 (a)(2-5), (c&d) and 53.620(a)(2-4), Construction and Manufacturing Organization and Procedures	None – Not necessary for NRC to approve the organization and plan during construction and manufacturing
53.1225 PRA Maintenance Program for 53.450(c)	None – Not necessary for NRC to approve the controls for updating the PRA
53.460(c) Human Action Performance Program	None – Duplicates the training and other operational programs related to performance of human actions

- NRC should eliminate all of these programs as they are not needed for reasonable assurance of adequate protection

NRC Approach to Programs in Part 53

An unstructured approach is inefficient and creates unintentional challenges

- NRC's approach to administrative controls results in:
  - Dramatic expansion of NRC regulatory footprint over licensee controls
  - An unclear and unbounded set of programmatic information subject to NRC approval
- Part 53 requires more programs and administrative controls be approved by the NRC, as compared to Parts 50/52
- Part 53 requires approval of programmatic controls not required by Part 50/52
  - *Programmatic controls* mean administrative procedures that govern the actions of equipment and personnel of an advanced nuclear plant.
  - Required in 53.210, 53.220, 53.230, 53.240, 53.250, 53.260, 53.270, 53.400, 53.410, 53.420, 53.425, 53.430, 53.440, 53.460, 53.470, 53.490, 53.500, 53.510, 53.540, 53.610, 53.1225, etc.
  - Typically stated as "Design features and programmatic controls must be provided for…" – Not performance-based, clear or predictable

Programs Need to be Created with the Broader Regulatory Framework in Mind

- Programs work together with design features and human actions to for the technical basis for protecting the public
  - The role of programs is to provide reasonable assurance that the design features and human actions will perform the actions described in the licensing basis
  - Not all of the programs used by the licensee need to be required to be approved by the NRC
- The NRC imposes requirements that are effective even after the NRC issues a license for a new reactor
  - NRC has an oversight and inspection program to ensure compliance
  - NRC does not need to approve licensee controls related to compliance
- The licensee is competent in fulfilling their responsibility to perform administrative controls
  - QA Program permeates the plant at each stage; comprises all those planned and systematic actions necessary to provide adequate confidence that a structure, system, or component will perform satisfactorily in service
  - Very little need for NRC approval of other administrative controls to achieve reasonable assurance that design features and human actions will perform functions in the licensing basis

Performance-Based Approach to Part 53 Programs

Leads to a clear, predictable and flexible regulatory framework

- Recognize that the QA Program provides substantial assurance that design features and human actions will perform functions in the licensing basis
- Establish the purpose for programs (e.g., by stage)
  - **Design** - Provide reasonable assurance that the plant design is in accordance with the license and regulations.
  - **Manufacturing and Construction** - Provide reasonable assurance that the plant is constructed and manufactured according to the license and regulations.
  - **Maintenance** - Provide reasonable assurance that the SSCs are capable of performing their intended functions described in the SAR.
  - **Operations** - Provide reasonable assurance that the plant is operated according to the license and regulations.
- Establish performance criteria for each program, and entry criteria (graded)
- Evaluate suitability of historical programs required by Part 50/52
- Identify historical administrative controls not required to have NRC approval

Performance-Based Approach to Part 53 Programs

Leads to a clear, predictable and flexible regulatory framework

	Performance Criteria	Part 50 Programs Requiring NRC Approval	Programs not needing NRC Approval
Design	Provide reasonable assurance that the plant design is in accordance with the license and regulations. 1. Applicable regulatory requirements and the design basis specified in the license are correctly translated into specifications, drawings and procedures. 2. The design process used appropriate quality standards, selected materials, parts and processes, controlled interfaces among participating organizations, suitable to the safety significance of the SSCs, and provided for verifying the adequacy of the design. 3. Performance characteristics of SSCs that serve as the basis for the design and analyses are supported by validation data. 4. Design changes are subject to the same design control measures and approved by the same design organization used for the original design.	• Criterion III – Design Control (Appendix B)	• Change Control (50.59) • Records, reports and • FSAR Update (50.71) • Reliability Assurance Program (SRM-SECY-95-132) • Environmental Qualification (50.49(a))

Performance-Based Approach to Part 53 Programs

Leads to a clear, predictable and flexible regulatory framework

	Performance Criteria	Part 50 Programs Requiring NRC Approval	Programs not needing NRC Approval
Manufacturing and Construction	Provide reasonable assurance that the plant is constructed and manufactured according to the license and regulations 1. As-built SSCs are consistent with their as-designed specifications. 2. The applicable regulatory requirements are referenced in the procurement documents. 3. Procured material, equipment and services conform to the procurement specifications. 4. As-built SSCs, prior to operation, are capable of performing the functions described in the license.	• Criteria IV, VI thru XV – for safety-related SSCs (Quality Assurance - Appendix B) • Defined by Applicant - for non-safety related but risk important (50.69 Augmented Quality) • Initial startup testing program (50.34(b)(6(iii))	• NSR SSC – Any commercial quality program • Procurement program • Receipt and verification programs • Turnover and routine startup program • Reporting of Defects and Nonconformances (Part 21)

Performance-Based Approach to Part 53 Programs

Leads to a clear, predictable and flexible regulatory framework

	Performance Criteria	Part 50 Programs Requiring NRC Approval	Programs not needing NRC Approval
Maintenance	Provide reasonable assurance that the SSCs are capable of performing their intended functions described in the SAR. 1. SSCs, during operations, continue to be capable of performing the functions described in the license. 2. SSCs, for which the code or regulations require periodic inspection or testing, are confirmed to have not experienced unexpected degradation.	• Maintenance Monitoring Program (50.65) • ISI/IST (50.55a) • Material Surveillance Program – if applicable (Part 50 Appendix H)	• FLEX Equipment - if applicable (50.155) • Maintenance procedure development

Performance-Based Approach to Part 53 Programs

Leads to a clear, predictable and flexible regulatory framework

	Performance Criteria	Part 50 Programs Requiring NRC Approval	Programs not needing NRC Approval
Operations	Provide reasonable assurance that the plant is operated according to the license and regulations. 1. Plant stays within the licensed conditions of operations. 2. Administrative controls provide reasonable assurance that human actions credited for protection of public health and safety will be performed when needed. 3. Humans relied upon are trained and capable of performing assigned actions as described in the license.	• Technical specifications (50.36) • Training and Requalification Programs for Operators, Fuel Handlers and Other Identified Positions (50.2, Part 55, 50.120) • Operating Plans, Normal and Emergency (50.34(b)(6)(iv and v)) • Fire Protection Plan (50.48) • Radiation Protection (Part 20) • Emergency Planning (50.47 or 50.160) • Security (Physical, cyber, access and FFD) (Part 73, Part 26) • Environmental Protection – if applicable (51.50)	• Effluent release program • Worker safety training programs and effectiveness assessments • OSHA worker safety • Procedure development for operations and emergencies • Event Reporting (50.72/50.73)

Operational Programs

NRC creating duplicative and unnecessary programs

- Industry presented the preceding to NRC on September 15, 2021
- NRC response during the meeting
  - Can’t compare Part 53 requirements with Part 50/52 requirements
  - Industry doesn’t understand that NRC requirements are reducing regulatory burden
  - Regulatory burden within each program is less, so shouldn’t be concerned that there are more programs
- NRC has not provided a basis for requiring any of the programs in Part 53 that duplicate other programs or have no equivalent in Parts 50/52

Improving Clarity and Efficiency: Technology Inclusive

Cyril Draffin, USNIC

Technology Inclusive – All types of reactors

- During October 26, 2021 NRC Part 53 public meeting, NRC stated that they intend to revise preliminary language so that Part 53 is not restricted to only being used by “advanced reactors”
  - We agree this should be the intention
- Part 53 allows all types of nuclear reactor technologies
  - Avoid parallel rule frameworks for different technologies
  - Have separate guidance if necessary
  - Exclusion of any nuclear plant that is not considered “advanced” might unnecessarily exclude technologies that could meet Part 53 safety

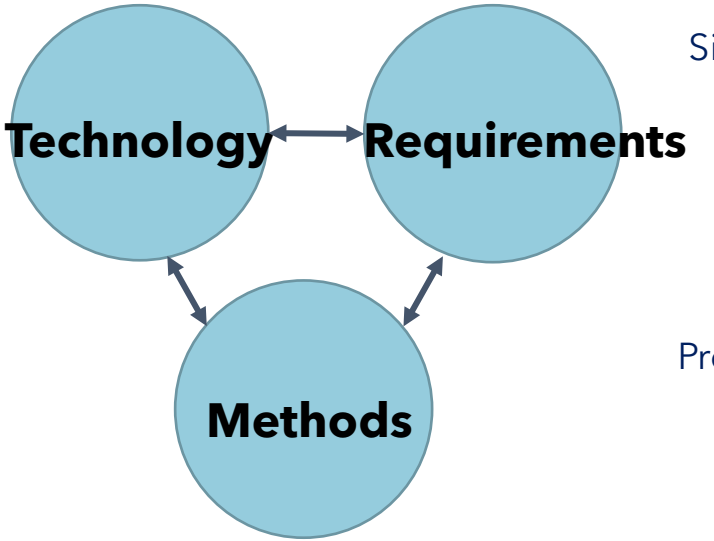
Technology Inclusive – All developers

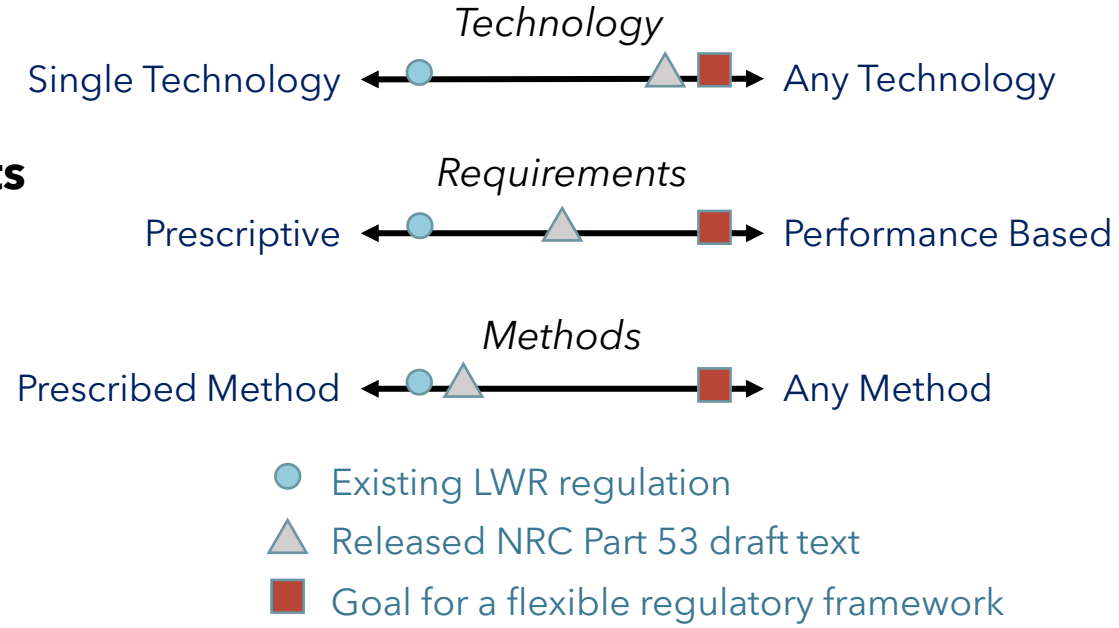
- Apply to all reactor developers and applications
  - Part 53 requirements are screening criteria determining if developer would use (and applicant would meet relevant safety requirements)
  - May be used for electricity, process heat, hydrogen production, and other applications
- Part 53 does not need to be limited in scope, and rule could easily be applicable to all production and utilization facilities licensed under AEA Section 103 or 104

Technology Inclusive – Consistent with NEIMA

- While NEIMA defined "advanced nuclear reactor" when it provided statutory requirements for NRC to develop Technology-Inclusive Regulatory Framework, it did not limit such framework only to "advanced" reactors, but rather stated that it should be "*flexible and practicable for application to a variety of reactor technologies*"
- NRC should not limit use of Part 53 to facilities according to features defined as advanced nuclear reactor in the NEIMA (B thru H), such as "*lower levelized cost of electricity*," "*increased thermal efficiency*" and "*ability to integrate into electric and nonelectric applications*," because these fall outside NRC's authority of regulating nuclear safety
- NRC should not limit use of Part 53 to reactors that have additional inherent or passive safety features because that establishes a "moving target" for applicability that could disrupt regulatory stability
- No benefit for NRC to create artificial screening criterion to compare Part 53 applicant's use of inherent or passive safety features in design to "significant improvements compared to commercial nuclear reactors under construction as of the date of enactment of this Act." If proposed design can meet Part 53 requirements for safety, that should be sufficient justification for utilizing Part 53
- Creating screening criterion to use Part 53 based on increased use of inherent or passive safety features is unnecessary, and is contrary to NRC's Advanced Reactor Policy Statement, which encourages but does not require enhanced safety of advanced reactors

Part 53 regulations can balance certainty and flexibility across multiple characteristics





source: Nuclear Innovation Alliance, 9 December 2021 presentation to NRC Commissioners

Goals for Regulatory Efficiency

Cyril Draffin, USNIC

Complexity Creates Problems – guidance might help resolve (1/2)

- For effective licensing, NRC needs to have high-level plan on how Part 53 will integrate all aspects of regulation
  - Including rules, guidance, staff interpretations, and oversight during operations
  - To date, Part 53 guidance limited (other than TICAP designed for Part 50/52)
    - Without guidance (e.g. for change control) not possible to fully assess NRC preliminary approach
    - NRC provided list of needed guidance earlier in 2021, and 9 month delay offers time
  - Limited clarity on how to have timely reviews and avoid submission of unnecessary information in applications under Part 53
  - Limited clarity on scope and extent of inspections during operations, and what operational flexibility will be allowed

Complexity Creates Problems – guidance might help resolve (2/2)

- Without clarity, overlapping requirements and programs may make it harder for NRC staff to approve applications and implement rule
  - Goal is to focus on safety significant aspects of technology, and not be distracted by minor issues with very limited impact on safety
  - Rapid scale up of advanced reactor applications could challenge the staff's ability to make timely regulatory decisions

NRC Internal Goals for Part 53 Regulatory Efficiency

- With potential order of magnitude increase in applications, NRC needs metrics to judge their internal regulatory efficiency
  - Shorter and predicable timeframes (e.g. number of months) to review license applications
  - Effective use of prior Topical Reports and other approvals (include documentation submitted and approved by other regulatory organizations)
  - Lessons learned
  - RAIs (reduce requests for additional information, especially for non safety-significant matters)
  - Benefits of pre-application reviews focused on key issues; early escalation of key policy issues
  - Effectiveness of core teams for licensing reviews of FOAK and subsequent applications
  - Constraints on unnecessary oversight reviews and inspections
  - Long term regulatory stability
  - Develop scalable process
  - Eliminating inefficiency and making best use of NRC staff resources (importance of both efficiency and effectiveness)

NIA Dec 2021, Promoting Efficient NRC Advance Reactor Licensing Reviews to Enable Rapid Decarbonization

Clear Vision and Specific Goals for Final Rule (1/2)

- Encourage NRC to establish clear vision and specific goals for the final Part 53 rule, and to utilize systematic approach to developing rule
- From Unified Industry Position (letter dated July 14, 2021) re Part 53
  1. Available for use by all technologies and risk-informed licensing approaches
  2. Less burdensome over the lifecycle of activities (e.g., licensing, construction, operations, oversight), than regulating under the existing Parts 50 and 52
  3. Built upon performance-based requirements that define clear and objective acceptance criteria
- Vision, goals and systematic approach are important to ensure that the final rule will be successful
  - Rule to effectively accommodate large number of reactor applications
  - Provide different pathway for new reactor designs

Clear Vision and Specific Goals for Final Rule (2/2)

Industry has proposed Principles in Adopting New Part 53 as far back as 10 October 2019 NRC public meeting-- USNIC "10CFR Part 53: Ideas for Risk-informed, Technology Inclusive Regulatory Framework for Advanced Reactors Rulemaking"

- New Part 53 should be focused on technical requirements and should minimize administrative requirements inconsistent with efficient licensing
- Eliminating or streamlining requirements that are overly prescriptive or not relevant will reduce need for future exemptions
- Need to avoid putting too much detail in FSAR – simplicity is the key
- Revisit content of application requirements to right-size FSAR to reflect safety-significance of systems, structures or components (also applies to operational programs like maintenance rule, QA, radiation protection, in-service inspection, startup)
- Consider required reviews in fixed period of time (e.g. 2-3 years for Small Modular Reactors; 6 months for micro-reactors) once initial SMRs and micro-reactors have been approved
- Commission needs to address ongoing policy questions associated with security and emergency planning zone requirements to recognize the reduced source term and size of these designs, in order to avoid potential conflicts in a future Part 53

and NEI's October 21, 2020 letter - ML20296A398

Path for Exemptions in Part 53

- For non-LWRs, substantively fewer Part 53 exemptions likely to be required vs. Part 50 & 52
- But smooth process for Part 53 exemptions also may be needed
  - Many potential applications might be presented to NRC (with different coolants, fuels, technology designs and sizes)
  - NRC could make process easier in Part 53, and proactively recommend exemptions

Part 53 Coordination with other Rulemakings

Important contemporaneous efforts underway:

- Emergency planning
- Security
- GEIS (Environmental reviews)

As appropriate, NRC should better integrate safety, security, EP, and siting

Similar ACRS and Industry Input

Cyril Draffin, USNIC

Similar ACRS and Industry input on Part 53 (1/2)

- Drop two tier structure
- Flow of objectives, safety criteria, safety functions
- Decouple requirement for normal operation
- Not require or rely on just LMP approach or IAEA approach
- Part 53 can be methodology neutral, and PRA language should be modified to enable use of PRA in ways applicants expect to use the tool
- Applicants use spectrum of risk-based and deterministic approaches
- Part 53 should be risk-informed not risk-based
- Broad interpretation of credible event increases regulatory uncertainty

Similar ACRS and Industry input on Part 53 (2/2)

- Add requirements for safe, stable end state conditions
- Unify QA requirements (allow broader set of codes and standards)
- Provide detailed explanation of the integrated intent of the rule
- Duplication in draft
- More guidance is needed to clarify regulations
- Questioned ALARA in rule

Other topics

Cyril Draffin, USNIC

Quality Assurance Requirements

- Unify all QA references in single location in Part 53
- Opportunity for fresh look at alternatives to NQA-1
  - Commercially available components quality may meet/exceed “nuclear standards” with reduced artificial burden
  - Rule should require quality control program, but not specify approach
- Guidance should support broad standards and approaches, e.g., ISO 9000 series, IAEA, commercial dedication
  - Reduce barriers to commercial competition, and facilitate licensing abroad– recognizing greater supply chain base can improve quality
  - International acceptance of a single approval could be important in international marketability
  - Guidance should show ISO standards and IAEA approaches meet requirements
  - Guidance could address topic of universal acceptance of codes and standards (mechanical, electrical)
- NEI is developing guidance on using ISO-9001 to meet Appendix B QA requirements
  - Available to operating fleet, new reactors licensing under Parts 50/52, and for Part 53 (if Part 53 QA requirements consistent with Appendix B)

5 November 2021 NEI/USNIC letter & attachments

Goal for Part 53 consolidated industry comments:
Provide clarity and detail on perspectives provided to NRC in meetings and letters over the past year, especially in areas where NRC has not addressed our concerns or described why they aren't addressing our concerns

- Attachment A: Comments by specific topical areas; addresses beneficial features and significant challenges (22 pages)
- Attachment B: Detailed comments on nearly all of preliminary Part 53 rule language, regulation-by-regulation; specific proposed revisions provided (83 page table)
- Attachment C: Prior submissions made by USNIC/NEI since 2019 (4 pages; 40 submissions)

Backup or reserve slides

Example A: NEI 18-04 (Leading Role)

TI-RIPB Principle	Approach to Meet Principle in Example A
1. Meet established limits for adequate protection	• PRA frequencies and consequences ensure LBEs are within the F-C curve, and QHOs are not challenged • Deterministic safety analyses for DBAs validate safety case made by PRA
2. Establish the safety functions, design features and functional design criteria	PRA delineates the relevant safety functions, which define safety features, which are used to select functional design criteria for each type of LBE
3. Selected LBEs adequately cover the range of hazards	• PRA is the primary component of an iterative process to select the LBEs in a systematic and comprehensive manner • Deterministic methods are used to support the iterative process to select LBEs based on the PRA
4. SSCs are categorized according to their safety significance	PRA is used to categorize SSCs according to the roles they play in satisfying the safety functions
5. Design reflects the application of an appropriate philosophy of defense-in-depth	PRA is used to establish DID through systematic evaluation of LBEs, with systematic determinations of adequacy, including the need to account for uncertainties
6. Special treatment for SSCs, programmatic controls and human actions are appropriate	• PRA input to integrated decision-making panel to identify special treatment beyond safety-related SSCs • Quantitative reliability targets set for significant SSCs

Example B: NEI 18-04 (Confirmatory Role)

TI-RIPB Principle	Approach to Meet Principle in Example B
1. Meet established limits for adequate protection	• Deterministic analyses determine the limits are met • PRA confirms F-C curve and the QHOs are not challenged
2. Establish the safety functions, design features and functional design criteria	• Deterministic analyses systematically establish safety functions, safety features and functional design criteria (e.g., use of ARDC) • PRA confirms or identifies vulnerabilities to address
3. Selected LBEs adequately cover the range of hazards	• Deterministic methods are primary component of iterative and systematic process to select the LBEs • PRA supports deterministic methods in iterative process
4. SSCs are categorized according to their safety significance	• Deterministic methods used to categorize SSCs according to the roles they play in the DBA analysis • PRA determines additional SSCs with special treatment
5. Design reflects the application of an appropriate philosophy of defense-in-depth	• Deterministic methods systematically establish DID and adequacy, including the accounting for uncertainties • PRA confirms or adjusts DID to establish adequacy
6. Special treatment for SSCs, programmatic controls and human actions are appropriate	• Categorization establishes need for special treatments • PRA input to integrated decision-making to identify ST for SSCs other than SR

Example C: IAEA

TI-RIPB Principle	Approach to Meet Principle in Example C
1. Meet established limits for adequate protection	• Deterministic analyses determine the limits are met • PRA searches for cliff-edge effects, and can be used to confirm F-C curve and the QHOs are not challenged
2. Establish the safety functions, design features and functional design criteria	• Deterministic assessments and requirements establish safety functions, “principal technical requirements” and design requirements (equivalent to NRC) • PRA is used to confirm deterministic results
3. Selected LBEs adequately cover the range of hazards	• Deterministic methods establish LBEs (Normal, AOO, DBA, and BDBE) and characterize plant response • PRA informs through systematic search and perspective on frequencies
4. SSCs are categorized according to their safety significance	• Deterministic assessments are primary means of categorizing SSCs and are informed by PRA insights
5. Design reflects the application of an appropriate philosophy of defense-in-depth	• Deterministic assessment of DID adequacy through formal framework • PRA results provide further assurance of DID adequacy
6. Special treatment for SSCs, programmatic controls and human actions are appropriate	• Deterministic engineering analyses and judgement • PRA insights to confirm and inform

Example D: Bounding Analysis

TI-RIPB Principle	Approach to Meet Principle in Example B
1. Meet established limits for adequate protection	• Deterministic analyses determine the limits are met • Risk information* provides perspective on the margin and demonstrates that the QHOs are not challenged
2. Establish the safety functions, design features and functional design criteria	• Deterministic analyses systematically establish safety functions, safety features and functional design criteria (e.g., use of ARDC) • Risk information in limited role to confirm most challenging accidents included
3. Selected LBEs adequately cover the range of hazards	• Deterministic methods identify and confirm adequacy of events (one or small set) with bounding consequences • Risk information in limited role confirm events are bounding
4. SSCs are categorized according to their safety significance	• Deterministic assessments conservatively categorize SSCs
5. Design reflects the application of an appropriate philosophy of defense-in-depth	• Deterministic methods systematically and conservatively establish DID and adequacy • Risk information provide additional assurance of DID adequacy
6. Special treatment for SSCs, programmatic controls and human actions are appropriate	• Deterministic engineering analyses

*Risk information includes a PRA; however, the PRA would be simplified and limited in scope