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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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REGULATORY RULEMAKING, POLICIES AND PRACTICES:

PART 53 SUBCOMMITTEE

+ + + + +

TUESDAY

OCTOBER 18, 2022

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The Subcommittee met via Video Teleconference, at 8:30 a.m. EDT, David Petti, Chairman, presiding.

COMMITTEE MEMBERS:

DAVID PETTI, Chair

RONALD G. BALLINGER, Member

VICKI BIER, Member

CHARLES H. BROWN, JR., Member

VESNA DIMITRIJEVIC, Member

GREGORY HALNON, Member

JOSE MARCH-LEUBA, Member

JOY L. REMPE, Member

MATTHEW SUNSERI, Member

ACRS CONSULTANT:

DENNIS BLEY

STEPHEN SCHULTZ

DESIGNATED FEDERAL OFFICIAL:

DEREK WIDMAYER

ALSO PRESENT:

BOB BEALL, NMSS

MIHAELA BIRO, NRR

KEITH COMPTON, RES

DAVID DESAULNIERS, NRR

ANNE-MARIE GRADY, NRR

JORDAN HOELLMAN, NRR

WILLIAM JESSUP, NRR

WILLIAM RECKLEY, NRR

JOHN SEGALA, NRR

JESSE SEYMOUR, NRR

MOHAMED SHAMS, NRR

MARTIN STUTZKE, NRR

BOYCE TRAVIS, NRR

KATIE WAGNER, NRR

JIM XU, RES

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

8:30 a.m.

CHAIR PETTI: Good morning, everyone, the meeting will now come to order. This is a meeting on the Advisory Committee on Reactor Safeguards Radiological Rulemaking Policies and Procedures Part 53 Subcommittee.

I'm David Petti, Chairman of the Subcommittee. ACRS Members in attendance today are Joy Rempe, Ron Ballinger, Charlie Brown, Vesna Dmitrijevic, Jose March-Leuba, Greg Halnon, Vicki Bier, and Matt Sunseri.

Our consultant, Steve Schultz, is on the line. I do anticipate Dennis Bley will be joining as well. Derek Widmayer of the ACRS Staff is the designated federal official for the meeting.

The purpose of this Subcommittee meeting is to hear from the Staff concerning the preliminary rule language for 10 C.F.R. Part 53 risk-informed technology-inclusive regulatory framework for commercial nuclear plants.

This meeting is the last Subcommittee meeting in a series of meetings on the preliminary rule language for 10 C.F.R. Part 53. The next time the Subcommittee sees the rule, we will be reviewing

proposed rule language prior to it being published for public comment.

The Subcommittee will gather information, analyze relevant issues and facts, and formulate proposed positions and actions as appropriate. There's a section scheduled for discussions at the November 2022 full Committee meeting at which these matters will be presented and discussed.

And the Committee plans on preparing a letter report on these matters 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 inform preparatory work that will support our deliberations at a full Committee meeting. The rules for participation at all ACRS meetings including today's were announced in the Federal Register on June 13, 2019.

The ACRS Section of the U.S. NRC 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 all written or oral input to the Subcommittee may do so and should contact the designated federal official five days prior to the meeting as practicable.

Today's meeting is open to public attendance and we have received one request to make an oral statement at the meeting.

Time is provided in the agenda after presentations are completed for spontaneous comments for members of the public attending or listening to our meetings.

Today's meeting is being held over Microsoft Teams allowing participation of the public over the computer using Teams. A bridge line is also established to allow listening by phone and a transcript of today's meeting is being kept.

Therefore, we request that meeting participants on Teams and the bridge lines 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/or telephone lines on mute when not speaking to minimize disruptions.

At this time, I ask the Teams and telephone bridge line attendees make sure that they are muted so that we can commence the meeting.

We'll now proceed and I call on Mo Shams, Director of the Division of Advanced Reactors in Non-power Production and Utilization Facilities of the Office of Nuclear Reactor Regulation to make opening remarks. Mo?

MR. SEGALA: Hi, this is John Segala, I'm filling in for Mo. I am the Special Assistant in the Division of Advanced Reactors in Non-power Production and Utilization Facilities in the Office of Nuclear Reactor Regulation.

I'd like to say good morning to everybody. We are excited to be here today to discuss 10 CFR Part 53, which would be a new alternative risk-informed, performance-based, and technology-inclusive framework for the licensing and regulation of commercial nuclear plants.

The objective of Part 53 is to continue to

provide reasonable assurance of adequate protection of public health and safety in the common defense and security, promote regulatory stability, predictability, and clarity, reduce requests for exemptions from the current requirements in Parts 50 and 52, establish new requirements to address non-light water reactor technologies, recognize technological advancements in the reactor design, and credit the possible response of some designs of commercial nuclear plants to postulated accidents, including slower transient response times, and relatively small and slow release of fission products.

The NRC Staff previously briefed the ACRS full Committee on Part 53 in July of 2022 and benefitted from the feedback we received during those discussions.

On August 2nd, the ACRS issued its fourth interim letter on Part 53 and on September 30th, the NRC Staff issued a response addressing each of the eight ACRS recommendations.

Since the July ACRS meeting, the NRC Staff has continued to engage extensively with stakeholders and has had an opportunity to consider verbal and written feedback from stakeholders as part of the Staff's ongoing efforts to enhance the proposed rule

package.

To support today's ACRS Subcommittee meeting, the NRC Staff released the draft proposed Part 53 rulemaking package on September 30th, which includes the draft proposed rule language from Framework A and B, the accompanying preamble, or what we used to call the statements of consideration, and five draft guidance documents supporting the draft proposed rule language.

Today and tomorrow the NRC Staff plans to provide the ACRS Subcommittee an overview of the enhancements the Staff has made to Part 53 rule language since we last briefed the ACRS in July, which reflect consideration of the input received from the ACRS and stakeholders.

The NRC Staff also plans to provide an overview of the five draft guidance documents. We are looking forward to having discussions today and hearing any ACRS Members' thoughts and feedback.

This completes my opening remarks and I will now turn it over for the Staff discussions to Jordan Hoellman. Thank you.

MR. HOELLMAN: Thanks, John.

Good morning, everyone. My name is Jordan Hoellman. I'm a Project Manager in the Advanced

Reactor Policy Branch in NRR. I'm happy to be here today to talk you through some of the introduction material for Part 53, give a recap of how we got here, and let's move to the next slide.

The next slide just lays out the agenda for today. There is another slide like this later in the package that lays out the agenda for tomorrow. So, I'll begin with an overview of, like I said, the schedule, how we got here, that kind of stuff.

I'll turn it over to Bill Reckley to talk about Framework A, and I think Bill Jessup will talk about Framework B. And then we'll talk about the draft proposed language for the QHOs and safety analysis and the differences between Frameworks A and B there.

And then this afternoon we'll have a discussion of the proposed rule language for the alternative evaluation for risk insights or AERI methodology and guidance documents for licensing events.

Next slide, Billy.

As John mentioned and everyone knows I'm pretty sure, we briefed the ACRS a number of times over the past two years so we didn't feel it was necessary to cover everything including the enactment

of the nuclear energy innovation and modernization act in January of 2019 and all the activities leading up to it.

But we did think it would be worthwhile to walk through some of the steps we took and direction we've gotten that took us to where we are now.

Back in 2020, we issued the rulemaking plan. We proposed to develop a new 10 CFR Part that could address performance requirements, design features, and programmatic controls for a wide variety of advanced reactors through the life of a facility.

We said we'd focus the rulemaking on risk-informed functional requirements building on existing NRC requirements, Commission policy statements, and recent and ongoing activities.

And then we said we would be seeking extensive interactions with external stakeholders including the ACRS on the content of the rule.

The SRM that the Commission issued in the fall of 2020 approved the Staff's proposed approach but the rulemaking directed the Staff to provide a schedule with milestones to provide the draft proposed rule to the Commission by October 2024 to identify key uncertainties impacting publication of the rule, and to provide options for the Commission regarding the

licensing and regulation of fusion energy systems.

And the SRM also directed the Staff to develop and release preliminary proposed rule language intermittently followed by public outreach and dialog. So, we've been doing that, like I said, for the past two-plus years.

In the fall of last year, the Staff requested a schedule extension which was approved by the Commission to do mainly three things, provide additional time for the Staff to continue efforts to reach alignment with external stakeholders on the scope of the rulemaking and to further develop the language to allow additional time for external stakeholders to participate constructively in the rulemaking process, and to ensure better coordination with other NRC advanced reactor readiness activities.

So, mainly, over the past year, we really dove into the development of Framework B, which stemmed from what we presented last year on what we called Part 5X, and continued to engage with stakeholders extensively on the progress of the rule and the preliminary proposed rule language.

So, we got a number of comments from public stakeholders in the industry throughout the public comment period on the preliminary proposed rule

language, which closed on August 31st of this year.

And like John mentioned, on September 30th we issued the draft proposed Part 53 rulemaking package to support these meetings and other stakeholder engagements.

Billy, let's move to the next slide. Please feel free to interrupt if you have any questions.

MR. BLEY: Jordan, Dennis Bley. On your last slide I didn't see interactions with the Committee showing up. When do you folks expect to be back to the Committee again? Is it going to happen as you develop more guidance documents?

Where do you see it happening?

MR. HOELLMAN: You're talking about ACRS, correct?

MR. BLEY: I am.

MR. HOELLMAN: Okay, so at the bottom you see October, November 2022, that's ACRS interactions on the rulemaking package. There are a number of guidance documents that are being developed. We'll talk about that tomorrow afternoon a little bit.

A number of them are proceeding separately from the rulemaking package and the strategy or reason for doing that is essentially to be able to issue

guidance to support early applications under the existing regulations to continue to learn lessons from early reviews and gain experience, be able to make modifications, things like that.

So, as we came to you with, say, NUREG 2246, the fuel qualification guidance for advanced reactors, the endorsement of ASME Section 3 Division 5, endorsement of the non-light water reactor PRA standard, we'll continue to engage with the Committee on those.

But it would be separate from the rulemaking, this rulemaking package.

They will support the rule when the final rule is issued. It's just the timeline we're all in. We're trying to move in parallel to both support the Part 53 rule and support applications under the existing regulations.

MR. BLEY: On the rule itself do you see coming back to the Committee before issuance of the draft final rule?

MR. HOELLMAN: I may need to rely on our rulemaking Project Manager for this. I know we're coming back next month for full Committee. I'm not sure we plan to have another interaction before the rule goes to the Commission in February of 2023.

Bob, Bill, if I'm wrong please correct me.

MR. BEALL: This is Bob Beall. I'm the Project Manager in the NMSS Rulemaking Branch and so this is the formal presentation of the Part 53 rulemaking package to the ACRS for the ACMR and the full Committee in November.

So, this is the last formal process or presentation of this package to the Committee.

As Jordan mentioned, we have other supporting documents that we're removing separately from the package but what you have that's been sent to you and been presented to you today and tomorrow will be the documents that will be moving with the package to the Commission in February of 2023.

MR. BLEY: After you receive public comments -- well, go ahead, Dave may have more questions on this later.

CHAIR PETTI: Yes, I have the same concern about will there be any interaction on your slide before December 2024? I'm assuming there will be public comment, you'll make some changes?

MR. BEALL: Yes, Dave, that's correct, that will be for the final rule and so, yes, we will come back to you, we will have a number of interactions with you at the proposed rules published

and when we come back we'll have public comments and we'll have additional interactions with you as we develop the final rule.

CHAIR PETTI: Got it, thanks.

MEMBER BROWN: Can I ask a question? This is Charlie Brown.

MR. BEALL: Yes, sir.

MEMBER BROWN: I wanted to springboard off of Dennis's comment on the supporting documents, the Regulatory Guides or comments. Since we've got Framework A and B, Framework A is kind of the new age, Framework B is roughly kind of like the old stuff with a few enhancements.

That's my personal opinion, whether that's accurate or not, I'm not sure.

Are these additional guidance documents going to be focused on the Framework A approach to doing business? Are they going to be mixed, or are they going to be separate ones for each framework?

MR. HOELLMAN: Thanks for the question, Charlie.

The way I think we're envisioning it now, a lot of the documents we're working on, I know we've presented as part of Part 53 on the technology-inclusive content of application project and the

advanced reactor content of the application project, commonly referred to as TCAP and RCAP.

Those guidance documents are being developed for Parts 50 and 52 only right now. They're being done that way because if we develop them for Part 53, they can't be used or implemented or issued as official Agency documents and guidance until the Part 53 rule is published as a final rule.

And because we know we have applications coming in under the existing regulations, we think it's better to get guidance out there to support early movers to be able to exercise the guidance, learn lessons from doing those reviews, and make modifications.

So, in between the proposed and final rule for Part 53, those guidance documents will need to be updated to include applicability to Part 53. And to answer your question more directly, I think for the most part we plan on developing guidance for both approaches.

MEMBER BROWN: Excuse me, Jordan, the stuff that's been done under RCap and TCap, Part 50 and 52, I understand you want to get those out so they can be used.

But you talked about, my inference from

your comment was that to go along with Part 53 there were going to be five or some number you listed types of guidance documents.

I thought those were Part 53 documents. I didn't see how they related to the RCap TCap stuff, which is Part 50 and 52.

And so on these additional documents, my question fundamentally, I think you answered it right at the end, are going to be segregated or separated however way you want to phrase it, those that would be guidance relative to Framework A and one or two or three guidance we've developed to be exercised with Framework B.

Maybe they would be consistent with the Part 50 and 52 stuff or come from those but it would seem to me that your Framework A is pretty much different from the 5052 approach and that you'd need to be able to separate some of the older stuff with whatever you want to do relative to the Framework A.

That's why I thought they should be separated but I wasn't quite sure what they were going to do.

MR. HOELLMAN: Yes, Charlie, that's correct. The documents moving with the package specifically support rule language and Part 53 that

essentially doesn't exist under the existing regulations, the new stuff for operator licensing, the AERI approach.

I guess the one outlier is the draft guide 1413, which we'll discuss this afternoon. That guidance document actually has applicability to Part 50, Part 52, Part 53 Framework A and Part 53 Framework B.

And the reason I think we've tagged that along with the rulemaking package is because there was a number of stakeholder comments, I know the ACRS was interested in having guidance on that systematic identification of licensing and events.

We've had a number of discussions. There's been at least some confusion I've heard from external stakeholders about how to choose which framework you're in. And so that guidance is kind of set up to help in that respect.

CHAIR PETTI: Keep going, Charlie.

MEMBER BROWN: Oh, is that you, Dave? I'm sorry, I didn't mean to interrupt you.

CHAIR PETTI: No, keep going.

MEMBER BROWN: I guess my concern is, having built lots of stuff, having mixed guidance where you decide to pick a Part 53 Framework B and now

you sort through guidance documents that have mixed guidance, some that applies to A, some that would be applicable to B.

How does the industry sort that out unless they're separated? I'm struggling a little bit with mixing guidance for both Framework A and Framework B in the same guidance documents, and then having people sort it out.

Because inevitably, they start getting it comingled and then it becomes a problem for the industry and the Applicants to figure out what the heck they're dealing with, which just makes it harder on everybody.

MR. HOELLMAN: I understand the concern, Charlie.

I think what we'll need to do clearly is identify what's the regulatory basis, which regulations the guidance documents are associated with, and be really clear in the guidance documents.

What we're doing in the Part 5052 space, we do that sometimes and we need to depending on what's required for a construction permit application versus a combined license application.

And so it's similar to that. We developed a number of guidance documents, obviously Framework A

was essentially based off of the licensing modernization project guidance document in Reg Guide 1.233.

We used that as the foundation, as a risk-informed performance-based methodology to do the key stuff at the beginning to selection and identify licensing basis events, selecting and classifying your structure's system and components and sharing adequate defense in-depth.

So, we used that as the basis for Framework A to develop this performance-based technologically-inclusive approach. The TCap guidance expands upon that a little bit.

It does include some guidance that is specific to following the licensing and modernization project methodology but there's other guidance in there that can be used regardless of what methodology you're using.

So, we're getting ready to issue that for public comment.

I know we've briefed you all a few times on that, I'm looking forward to having the opportunity to brief you guys before we issued that final. So, hopefully maybe that will clear up some of the concerns related to how that is done.

But obviously, under Parts 50 and 52 and Framework B, we require principal design criteria.

In Framework A, we don't really do that, so we're definitely going to need to make some modifications to the TCap draft guide and some of the RCap ISGs to appropriately clarify how it works within Framework A.

I know I talked a lot there, I hope I helped.

MEMBER BROWN: Fundamentally, it sounds to me like it's a wait and see.

I just think you ought to be able to address that be able to explain to us at our next time, whenever we get through the public comment and we're into the preparation of the final rule processes, to make sure that's explained as to how this additional guidance for the Reg Guides are going to be able to be used and not get tied between each other.

I won't beat on this anymore. I'll let you go on unless Dave has --

CHAIR PETTI: I had a question.

MR. HOELLMAN: I was just going to say quickly, Dave, we can talk about it more tomorrow. We have a whole discussion on the various guidance

documents. So, maybe that will be another chance to recap and hopefully clarify things a little bit.

CHAIR PETTI: I wasn't going to ask this now, I was going to ask this question later, but you talked about this idea of issuing some of these guides in parallel with the rule and outside the rule so that early movers could have access to that.

And the question that has always been in my mind is AERI and why wouldn't AERI be useful in 52 given there will be micro-reactor applications coming in well before 53 becomes a rule and that guidance might be useful.

I don't necessarily need an answer now but it's in the back of at least my mind about whether or not there is some value there.

MR. HOELLMAN: I appreciate the question. I think we'll get into it more as we get into the AERI discussions this afternoon but I think fundamentally, it's because Part 52 requires a PRA and Part 50, it's Commission policy and expectation to do a PRA.

So, I think that's the fundamental reason why in Part 53 we're introducing this methodology to get out of having to do a PRA upfront and I think under the existing regulations, you'd need to request an exemption to do that.

Does that help? Marty --

CHAIR PETTI: We'll come back to it because I think it's a natural question. The other one, the event selection Reg Guide, obviously has great value so it's just a natural question to ask. Let's just keep going.

MR. HOELLMAN: I would assume that we could in pre-application discussions and various other forums and conversations with the Applicants, I think as we put things out, even if it's not a formal guidance document, it could be used to have a conversation in pre-application space and during early parts of the application to figure that out.

I'm sorry if I overtalked someone.

MEMBER HALNON: This is Greg. I want to get back to this slide if we can. The draft guidance for public comment, 60-day public comment period, I've seen a lot smaller rules get requested extensions well past 90 days, if not 120.

Are you prepared to be able to extend this if the industry and public come back and say the size of this rule, the amount of guidance, 60-day comment period is just not enough?

MR. BEALL: Hi, Greg, this is Bob Beall with Rulemaking again. Yes, we will take those

considerations and requests if we get them from the public for extents of the comment period.

We would have discussions with our management and we would seriously consider whether or not we should grant those extensions based on the input we get from those extension requests.

MEMBER HALNON: Have you guys encouraged the industry to start working on it now relative to their formal comments given the fact that the rule language is public at this point?

MR. SHAMS: Bob, I can help with that. Mr. Halnon, this is Mo Shams with the Staff.

Yes, the answer to that is yes, in our interactions with the industry we've started to indicate that the rule is already out now and the package that we're sending to you all is out.

The changes that we would anticipate is not likely to be significant or very fundamental so there's an opportunity to start assembling comments now and leveraging the timeframe until the actual comment period.

MEMBER HALNON: Very good, thanks a lot, I appreciate that.

MR. SHAMS: Always.

MR. HOELLMAN: Any other questions before

we move on? Billy, let's move to Slide 4. Here are the layouts of the two frameworks we've been discussing for a couple meetings now. This is intended to give a broad overview of Part 53.

It's a series of subparts A through U. Subpart A is common to both frameworks. It provides the general provisions and definitions, both common and framework-specific.

Subparts B through k are the technical application requirements for Framework A as I noted before. And in the rulemaking plan, Framework A was intended to align with the licensing and modernization project, a PRA-led approach.

It's a top-down approach starting with high level of safety objectives, technology-inclusive safety requirements, and high-level performance standards. Subparts N through U are the technical and application requirements for Framework B.

The genesis of Framework B was really in response to stakeholder feedback requesting that a technology-inclusive traditional licensing option that aligns more with international guidance and approaches. It uses a traditional use of risk insight and specific design rules.

And it requires the Applicant to design

principal design criteria, and it includes the alternative evaluation for risk insights, or AERI, approach, which would not require a PRA if certain entry conditions are met.

As mentioned in previous meetings, while some of the subparts in each framework are reproduced, you'll see that with a number of them, the classic example we've been giving is Subparts G and Q on decommissioning.

The internal cross-references within the subpart started to cause some confusion and were a little bit more trouble for us as the staff then just reproduced it in the new framework.

So, from our perspective, we thought it provided some clarity to make two distinct frameworks with their own set of consolidated requirements. And so that's how we ended up with Framework A and B.

Like I mentioned, some of the subparts are equivalent between the two frameworks and we've tried to increase clarity in the preamble discussion by having a common preamble for those subparts.

So, you'll see like I said, Subpart G and Q will have a common write-up in the preamble discussion. I'm ready to move to Slide 5 --

MEMBER DIMITRIJEVIC: This is Vesna.

It's true that we have discussion with you this many times but we have been discussing -- so, you are set on this organization, you are set on that horizontal route, this is an easy part of calling it Framework A and B, renaming it to alpha, beta, or giving it some different name, not to be confused with Subparts B and A.

That's my first question.

My second question is in these parts which are common you are definitely set to have them as a part, you don't want to keep them not to have repetition. You don't want to keep them as common as you are keeping Subpart A common to the A and B.

This is where the confusion starts, or common to that. So, to reduce the pages of the repetition.

And my third question was to this Subpart B and C, should they have versions for Framework B if you want to keep those frameworks if your main idea is they can standalone.

So, those are my three questions. Those are easy questions actually, compared to what you just had on the previous slide.

MR. HOELLMAN: I think the titles of Framework A and B, that's something we've talked about

a number of times as we've gone along here. That's sort of just where we ended up.

I think there's still opportunity to make them Framework I and II if we wanted to do that, and that continues to cause confusion.

Hopefully that answers your question, it was just sort of to distinguish they're two and separate and distinct. But I understand the comment.

With respect to having Subpart A be common and direct you into the frameworks, we did add some front matter material in 5300 and 53010, which were intended to provide some additional clarity in how it works.

I guess we could have done general provision section for each framework but with a number of the comments we got about trying to align the frameworks and with the common definitions, I think we thought that added some -- there was some benefit to aligning where we could.

And then with respect to your last question on Subparts B and C and why they're not in Framework B, that's just based on the traditional licensing frameworks where the technical requirements are in the content of application section.

So, the technical requirements in

Framework B would be found in Subpart R and Billy, Jessup, and Boyce will discuss that later. Mo, I see a hand up, I don't know who to go to.

MR. JESSUP: Hey, Jordan, this is Bill Jessup from the NRC Staff.

I just wanted to add some comments to Jordan's responses to your questions, the first one, that's correct but this is the formula we've settled on in the preliminary proposed rule text welded to the second question in consolidation with requirements.

But from the last iteration, we did find some opportunities for consolidation particularly in the area of operator licensing and staffing and qualifications. You'll see those requirements are now consolidated in Subpart F.

So, to your point, that was an opportunity, a unique place, where we could consolidate the requirements and reduce the page counts so-called.

But other areas, as Jordan mentioned, it does become a challenge if you start trying to force consolidation.

Jordan brought up the example of the decommissioning requirements in Subparts G and Q. You could consolidate them but the usability I think

decreases.

We experimented with several options for that consolidation early in the development of Framework B and we've ended up with what's been conveyed here in the preliminary proposed rule package.

And on your last question, again, Jordan, you captured it correctly.

The safety and design requirements in Framework B, they are captured in Subpart R as technical content of application or requirements in the same way that they are today in the existing framework under 50 and 52.

And since Framework B, it does operate more like Parts 50 and 52. We had elected to preserve that format and so those safety and design requirements, again they show up in Subpart R not as separate subparts.

So, I just wanted to add that, Jordan.

MEMBER DIMITRIJEVIC: Thank you. I was aware of all of these things. I'm just wondering, did you think about the possibility of those changes? Because this is what we saw from the beginning when you introduced Framework B.

So, I was just wondering did you consider

the improvements in the realization there? But thanks for your response.

MR. HOELLMAN: Mo, did you want to say something?

MR. SHAMS: Nothing in addition to what you and Billy said. So, thanks.

MR. HOELLMAN: All right, just wanted to make sure.

Vesna, we did align the language between the subparts so that for the most part, the language is the same so there should be less confusion. But you're right, we didn't elect to consolidate specific subparts together more.

MEMBER DIMITRIJEVIC: Okay, thanks.

MR. HOELLMAN: 5, Billy?

This slide, you've seen this I'm sure, this is just the rule package or the draft proposed rulemaking package that we provided to the Committee to support this meeting.

We did separate the Federal Register notice into four enclosures, that was intended to help you and stakeholders be able to review the package more effectively, so for example, you could have the preamble discussion up and the actual rule text for either framework at the same time and not have to

scroll up and down the page to figure out what we said about it in the preamble.

And then the five guidance documents that we'll talk about later today and tomorrow. I think that's all I really wanted to talk about.

Tomorrow we'll talk about other guidance develop to support advanced reactor readiness more generally, so we'll get there tomorrow and I think we can move on.

This is pretty generic.

CHAIR PETTI: Jordan, just a question administratively.

All of them together get their own ML number under the rule package but then each individual gets their own ML number, so you can find it in more than one way I guess?

MR. HOELLMAN: If I understand the question correctly, the package is on the left side, that package includes all these documents on the right. They do have different numbers, though.

CHAIR PETTI: And the package itself gets a number?

MR. HOELLMAN: Yes. So, the package itself, if you go to that link it will pull up a list with all these documents in it. If you pull up, say,

Enclosure 1A, you'll only get the preamble.

CHAIR PETTI: Got it, thanks.

MR. HOELLMAN: Let's move on.

I alluded to the front matter sections before, these are things that had not previously been issued in the preliminary form but we've been discussing the layout and purpose of the frameworks the past couple of meetings.

Hopefully, these sections provides some additional clarity on how the proposed rule is set up and that each framework is distinct with their own set of consolidated requirements.

We do know that we've received a common comment from external stakeholders that the rule should consist of only one framework that can accommodate any licensing approach and use of PRA.

We agree that streamlined and efficient regulatory frameworks are desirable and that guidance should be used where practicable to reduce the size of the rule. And like I said, each framework must be viewed independently with some exceptions.

The methodologies between the two frameworks were just too distinct for us to make further consolidations, at least at this point in the rulemaking process. That's where we are.

Next slide, we'll talk about Framework A, this is the common subpart. This covers general provisions that are largely equivalent to the general requirements in Part 50.

The scope, written communications, employee protections, standards for review, exemptions and definitions, the definition sections where we wanted to focus our time this morning.

So, 53020 is the common definitions for both Framework A and B, most of these terms are equivalent to the corresponding terms defined in either 50.2, 52.1, and other existing regulatory definitions.

Their use would be consistent with how the terms are used under the existing regulations. I see a hand up. Do you want me to take the question now?

MEMBER REMPE: Go ahead and finish what you wanted say. This is Joy.

I know you have another slide on safety function but I had a comment about your definition for a commercial nuclear power-plant and I don't know when the best time is to do it but I assume it's after you finish discussing this slide.

MR. HOELLMAN: That's fine. I was going to talk about commercial nuclear plant now.

MEMBER REMPE: That's fine, go ahead.

MR. HOELLMAN: If there's a better time, just chime in, please.

You may recall that we initially started with the use of advanced nuclear plant which was intended to be consistent with the Nuclear Energy Innovation and Modernization Act's use.

This caused some confusion with the public and external stakeholders and so we modified the term about a year ago to recognize that feedback we were receiving. Essentially, it related it to just because you call something a dance doesn't mean it's safer.

And so we recognize we've been using that term a lot I think and like I said, Congress used the term in NEIMA so that's why we were trying to consistent with it.

We used the word plant versus reactor to recognize that co-located support facilities and radionuclide sources need to be considered in the licensing of a facility in that some of those radionuclides may be outside of the reactor vessel or coolant system.

So, it was intended to cover the facility and all hazards I guess. We used the phrase other commercial purposes to recognize that new plant

designs may be used for purposes other than electric power, which was intended to be consistent with NEIMA's definition.

And the definition of commercial nuclear plant refers to the commercial nuclear reactor, which comes from 50.2 with some modifications, to not preclude Part 53's applicability to potential of accelerated driven systems.

Joy, I don't know, do you want to ask a question now I guess?

MEMBER REMPE: Yes, please. I think it's wise that you did this but I also have seen some reports issued from stakeholders who believe that anything that -- a dance in going through Part 53 has got to be safer.

Your new definition would allow a large light water reactor to come through Part 53, right?

MR. HOELLMAN: It's not precluded specifically.

MEMBER REMPE: Right, and so I would emphasize the need to make sure it's recognized that this could happen in the new ISGs that are documented, who claim that the reactors coming through Part 53 are going to be safer and should have some better responses, et cetera.

Because I really do think that some of the stakeholder comments and reports that are coming through are talking past what the Staff is talking past and so it's very important.

And I think your text in the preamble is very good on this point but I just would caution you, you need to make sure it's in the draft text for other documents that are a part of this package.

And I can give you specific examples when we talk about the ISGs tomorrow.

MR. HOELLMAN: I appreciate that, Joy. As I've worked on different guidance documents, I know that we've been questioned by you guys a couple times on the use of terms like for non-light water reactors and things like that.

So, there are specific guidance documents that are written that way and we'll need to take another look at them in the next revisions. A lot of times that was done for efficiency in getting the document issued and in preparation for the types of applications we were expecting.

But I understand the point that the rule is intended to be technology-inclusive and the guidance should be also be.

MEMBER REMPE: There's really not any

gate, except if you go through the AERI approach, that's the only gate where it might be questionable whether a large light water reactor could use that option within this Part 53, correct?

MR. HOELLMAN: That's true I think.

MEMBER REMPE: I think that needs to be emphasized.

It's fine, I've seen some optimism in some of the new ISGs and I'm pretty sure it's been around in some of the other documents and we just need to make sure so that stakeholders won't be asking for a lot of things with Part 53 that wouldn't apply to a large light water reactor, which is now eligible to go through Part 53.

MR. HOELLMAN: Understood. Thanks, Dr. Rempe.

So, some of the other terms I wanted to talk about in Subpart A include manufactured reactor and manufactured reactor module.

These are defined to recognize the potential for manufacturing a nuclear reactor under a manufacturing license and transporting and incorporating that reactor into a commercial nuclear plant under a combined license.

So, these are the micro-reactors that

folks talk about.

The term module distinguishes a reactor that's loaded with fuel prior to transport and we'll talk about this more when we get into the requirements in Subparts E and O related to fuel-loading, which Bill Reckley will cover in a few slides.

The framework-specific definitions, in Framework A, I know there's been some discussion about this in the past so things like licensing basis events, anticipated, unlikely, very unlikely event sequences, we moved them all to Framework A-specific definitions and tried to use new terms that didn't conflict with how terms are traditionally used under the existing regulations.

And then we have definitions for functional design criteria and the different classifications of structures, systems, and components and special treatment.

In Framework B if you remember, a lot of the definitions supporting Framework B we're previously in Subpart N. We'd move those definitions from Subpart N to 53028, which is the Framework B-specific definitions. And Subpart N is now for citing.

So, some of the Framework B-specific

definitions include anticipated operational occurrences, functional containment, reactor coolant, pressure boundary, design basis, safety-related structures, systems, and components, and severe nuclear accident.

A number of these terms were taken or modified from the existing Part 50 regulations but made technology-inclusive. So, you'll see things like, for light water reactors a safety-related SSC means this, reactor coolant pressure boundary means this.

For non-light water reactors it's modified slightly.

Construction is one that we did put a separate definition in each framework.

It is defined framework-specific but it would cover the same concept but be applied to a slightly different scope of activities based on how structures, systems, and components are classified under each framework.

So, in Framework A, it's based on 50.10, the definition of construction but modified to apply to safety-related and non-safety-related but safety-significant SSEs based on the analysis requirements in Subpart C.

And Framework B is essentially equivalent to 50.10.

Slide 8 will talk about safety function. Safety function was included as a common definition in response to feedback we received from both ACRS and external stakeholders. It was noted in your guys' fourth interim letter.

We originally did not include a definition of safety function in Framework A because there were requirements to establish safety functions in Subpart B. See, Vesna, I'm doing what you told me about.

In Framework B we did not originally include a definition either because safety functions are implicitly captured through the requirements for PDC. So, we received feedback to better align the frameworks and feedback that safety functions are technology-inclusive requirements that should apply to both frameworks.

The definition, as you can see on the screen, which is just reproduced from the rule text, has generic elements but it's bifurcated to acknowledge the fundamental differences between the frameworks.

Defining critical safety function remains an explicit requirement in Framework A and there's

requirement for primary and additional safety functions.

There, in Framework B, the safety functions are addressed implicitly through the requirements to define principle design criteria and that's consistent with the current approach in the existing regulations.

MEMBER BROWN: This is the question, Jordan. They exist, like Parts 50 and 52 had, you know, Appendix A is fundamentally a bunch of principle design criteria when you really get down to it. And, this does not have any of that at all.

So they're not, you don't, you don't have a listing. They still have to be developed from what I can see the way this is written.

Is that correct?

MR. HOELLMAN: Are you talking about principle design criteria?

MEMBER BROWN: Yes.

MR. HOELLMAN: In Framework B, yes.

MEMBER BROWN: So they would have to be developed independently, even though there's no Appendix A, per se? Like there is in 50 and 52.

MR. HOELLMAN: Correct. Correct.

I mean we have guidance for, for well, the

GDC in Appendix A. I assume we would rely on that as, as sort of guidance for, for future light water reactor designs.

For non-light water reactor designs, we have Reg Guide 1.232, which lays out how principle design criteria can be developed and defined, for certain non-light water reactor designs.

MEMBER BROWN: Well, this can apply to a light water, as well as non. I mean 53 is not restricted to a non-light water design. At all.

MR. HOELLMAN: That's true, that's true.

MEMBER BROWN: So, your comment is that I guess your thought would be that even though there's no GDCs, somebody's going to have to develop them because you asked for them to be developed. They're going to have to go somewhere.

MR. HOELLMAN: Yes.

MEMBER BROWN: And reinvent the wheel?

MR. HOELLMAN: Yes, yes, Charlie, so --

(Simultaneous speaking.)

MEMBER BROWN: We've had this discussion before, unsuccessfully.

MR. HOELLMAN: Yes, no, I understand. I think this goes back to something we were discussing earlier with the, with the guidance.

And at least from my perspective, I see us capturing this when we go to update Reg Guide 1.232, to include the applicability to Part 53.

I see that as a place where that, that gives up an opportunity to really clarify how, how PDCs can be developed for Part 53, Framework B.

And it gives us another opportunity to, to learn from the work ongoing with applications under Parts 50 and 52.

I know it's maybe not the most satisfactory answer to your question, but these are things that, that we are considering.

It's just that a matter of the time line we were on for Part 53, and, you know, the work that we were expecting and have ongoing under the existing regulations.

We're trying to make sure we have robust, you know, clear guidance to support applications under Parts 50 and 52. And, so we didn't under Part 53, undertake trying to revise those guidance documents.

And, I think the Commission to acknowledge, you know, that we're going to learn from early applications and their SRM, I think they've reinforced it in, in a number of SRMs they've issued.

That, that those interactions and the

experience we gained from, from those application reviews, will continue to inform the Part 53 rulemaking as we move to the, you know, next stage and, you know, the draft final rule stage, I guess in 2024.

But you'll see them all again. So you'll have a chance to question us when we say --

(Simultaneous speaking.)

MEMBER BROWN: Well, the --

MR. HOELLMAN: -- here's the revision to Reg Guide 1.232.

MEMBER BROWN: Yes, but is it going to, it's not going to have, 1.232 it's it just seems like we're throwing the -- I've made the comment before, throwing the baby out with the bath water.

We've learned how to build light water reactors. We know what the problems are. And now we're saying we're going to go, go to Part 53.

We've got to redevelop that or dictate it somehow. I just don't know how that's going to work.

I'll let you go on. That's been my concern from the beginning.

MR. HOELLMAN: Yes, I understand the concern, Charlie. I think hopefully in guidance space I guess, you know, we'll for, you know, we have to do

things like that for light water reactors.

You know, Appendix A to Part 50 is the general design criteria, that I think we would expect to be defined as the principle design criteria in Framework B.

Or at least we'd be asking --

(Simultaneous speaking.)

MEMBER BROWN: I would agree with that but --

MR. HOELLMAN: We would be asking questions to, to say why not. And, it would be the applicant's you know, job to defend if they didn't want to, to do that. So.

There may be where, you know, that could happen, but we'll see when we get there, I guess. I'm not familiar enough with some of the light water reactor applications, NuScale and such, and I'm not sure if there's any exceptions there, but.

MR. SEGALA: Hey Jordan, this is John Segala. Just wanted to add that Framework B for light water reactors still has the general design criteria as requirements.

And then the guidance in Reg Guide 1.232 lists, has advance reactor design criteria, has high temperature gas cooled reactor criteria, has sodium

cooled fast reactor criteria.

And then says that the general design criteria can be used as guidance for establishing PDCs for, for non-light water reactors.

But we included that in guidance and then made it a requirement that, that PDCs have to be established in Framework B.

MEMBER BROWN: Yes, but it's not in the Rules part of it. It's I guess it's in the guidance, not in the Rule the way it is in Part 50 and 52.

That's the way I read your comment, your response.

MR. SEGALA: Yes. Yes, and when it comes down to it, it's going to be highly dependent on the technology, and on the actual reactor design.

And for, you know, reactors such as the Kairos Hermes test reactor, you know, they, we've worked with them and they submitted reports, on what their principle design criteria are going to be.

Mo, did you want to add something?

MR. SHAMS: I want, I want actually to respond to Charlie specifically.

Charlie, you're 100 percent right. We are putting the principle design criteria, and the GDCs outside of the requirements.

And part of that is, is that as a fresh look on things, optimization of how much regulations and requirements we have in the Regulations versus areas that we can handle effectively through guidance.

And, that was an area that was candidate for that.

So, so we often get the comments about, you know, how much of this Rule that you could, or should put a guidance.

So these are just examples of where we found opportunities to leverage in that regard.

MEMBER BROWN: To me, it just generates churn in some areas that you rehash what we've learned over what is it now, 60 years of building reactor plants.

An awful lot of that is perfectly germane to anything new. We're not going to melt reactors, regardless of what type of reactors they are. So.

MR. SHAMS: I'd like to associate myself definitely with that comment, that we're not melting reactors.

But no, your point is well taken. It does create its own set of opportunities and challenges. You know, having them in the rule, you know, having them in the Regulation.

Had opportunities and challenges. Having them outside of the Regulation will offer a different set.

But the technical content, the regulatory content, is still there. So we're hoping that that would offer the value that we're looking for.

MEMBER BROWN: Okay.

MEMBER HALNON: This is Greg. I got a quick question on the safety function definition.

Yes, as you may be aware, there's always been an ongoing issue with the definition in the large light water reactor world, relative to the reporting. And I noticed the reporting language is pretty much the same.

Have you guys table topped this definition in 53.230 to make sure that we haven't created the same decades long argument we've been having with the operating reactors, on reporting of loss of safety function?

(No audible response.)

MEMBER HALNON: I'll take that as maybe we need to look at it.

MR. SHAMS: Yes, I've got to go back to the staff. Yes, maybe Bill Reckley knows or others --

(Simultaneous speaking.)

MEMBER HALNON: And, maybe it will come out in the comments, and maybe we should encourage industry to table top it as well.

But I know that we've always had that conflict of, you know, what the industry thought the definition is. What the NRC decided it was. What the reporting criteria really meant.

And I didn't want to see the same, same argument come out with this. And we've got an opportunity to make sure we table top it and don't create that confusion.

MR. SHAMS: We'll take that and reflect on it, Greg. Thank you.

MEMBER HALNON: Great, thanks.

MR. SHAMS: Joy, you have your hands up?

MEMBER REMPE: I do. I think Boyce had his up though before me. Did he want to make a comment? Or it disappeared.

Okay, so I'll make my comment.

This is a theoretical one. When I look at Part 50, 52, and 53, I think even, severe accidents are part of that framework. We don't regulate severe accidents, but they're there in Part 50 and 52.

And I'm seeing you shake your head up, down, you agree with me Mo. And I, in fact with

Framework A, the staff has a sort of cut off frequency, which is nice because there wasn't with Part 50 and 52.

So, I just wanted to get that out there in the open so if somebody, a stakeholder were to come in and say well now you're going down to lower frequencies, I think the answer is no, there's guidance and it's part of the Framework as it has been since TMI occurred.

But it's not something we're regulating. We still have design basis accidents.

Is that a good way to answer that? Or are there some other insights that we could use to help clarify what's being done with Part 53?

MR. SHAMS: I think I associate 100 percent with the awards Joy, in the sense that we're not regulating in a way that's setting a bar any higher.

It's the intent was to offer again, a coherent set of requirements that capture what was in policy, what was in, what was in guidance, what's in practice.

And to your point, infusing their opportunities for cut off frequency that perhaps wasn't there before, or at least was done deterministically.

So, but the end of the day is that the bar is not being set higher, you know, in terms of what we're regulating versus now.

MEMBER REMPE: Good, thank you.

MR. SHAMS: Sure.

MEMBER PETTI: Let's keep going.

MR. HOELLMAN: Okay. I think we're moving into Framework A, and I think I'm turning it over to Bill Reckley.

MEMBER PETTI: I just wanted to say that I do think that the preamble helped a lot. It put things in more context.

I think you know, seeing, seeing it more in holistically with, with the preamble I think helps, you know, as opposed to getting it in pieces. I wouldn't call them bite sized pieces, but pieces. So.

MR. HOELLMAN: I appreciate that. Go ahead, Bill.

MR. RECKLEY: Thanks, Jordan, this is Bill Reckley.

Just one clarification from the previous discussion, and Bill Jessup and Boyce Travis might get into this as we talk about Framework B.

For light water reactors, the rule requires them to follow the GDC. And, so there is no

gap there, Charlie.

For as Jordan was saying, for non-light water reactors, they would build their PDC with the expectation that they start with the GDC.

So that, that really hasn't changed from the current requirements in Parts 50 and 52.

But that's Framework B, and I'm here to talk about Framework A. Dave, I think some of this will naturally also be what we were going to talk about in the next session.

And, so I'm going to try to quickly go through these. I know we're a little behind already, but I think we can catch up in the session that follows this.

Because there's a fair amount of topics we've already talked about, or will have already talked about by then.

So, Billy, if we can go to the next slide.

We've laid this out, we've laid this out in this presentation to go through each Subpart. But I do not plan to talk about each Subpart because we've gone through this many, many times before, for each of the Frameworks.

I'll point out where we're going to have additional discussions, and either in the following

session or tomorrow.

So in Subpart B again, Subpart B is critical to Framework A. It lays out the safety objectives and the safety criteria.

These are the basic performance measures. We've tried to make this a performance based approach, and these are where you need to start.

You need to have performance standards in order to have that kind of a structure. So the safety objectives, highest level limit, immediate threats to public health and safety, and take additional measures as appropriate considering the risk to the public health and safety.

And, then the safety criteria are laid out for design basis accidents, for event sequences other than design basis accidents.

And this is where we introduce the, the use of the QHOs as one of the performance measures. And, we'll talk about that following this morning's presentation.

And then the other items, defense in depth, normal operations, et cetera. So, that is Subpart B.

Subpart C if we go to the next slide, Billy, is laying out the design and analysis

requirements.

Again, this, this feeds into the general construct of Framework A where you have safety criteria.

From those, you identify the needed safety functions. From the safety functions, a designer is able to pick what design features they, they are going to use in order to perform the safety function.

And, then from there, once you get into the event analysis and other design requirements, you're going to define the functional design criteria for the equipment that is either safety related, or non-safety related, but safety significant.

So that gets into the bolded text, the safety categorization. We're going to talk about that.

There's some discussion about whether you need to have safety related, non-safety related but safety significant, and non-safety significant.

Or under Framework B, we also continue to have basically three categories. Safety related, important to safety but not safety related.

So we'll get into that discussion and why we think it's appropriate to have at least three categories.

So that in comparison to what we have provided you most recently, and what we provided you in the previous meetings including back in the summer when we went through all of Framework A, not really many changes to Subpart C.

But if as I'm going through these and you've looked at the changes that were made, or the, or the preamble if you have questions, obviously interrupt me.

Otherwise, I just have one or two items in Framework A that we were going to talk about as being kind of new, and significant. So that's really Subpart C.

Billy, if you want to go to the next slide. Slide 12 for Subpart D. This is the siting.

Again, really not any changes from what we had given you previously. Siting requirements remain there to basically answer the fundamental question: what can the site do to the plant, and what can the plant do to the site?

And, so you have the same things in terms of external hazards that need to be considered in the plant design.

And then things like population related considerations, for what might be the consequence of

plant events to nearby populations.

Note again, no significant changes in the most recently released text compared to what we had released in the, in the summer.

So Billy, if you want to go to slide 14.

This is construction and manufacturing. This is an item that, that we want to have a conversation about.

In the construction arena, really no significant changes from what we released in the summer.

And, those were largely taken from the construction requirements, the need for programs. The need for quality assurance and so forth, during construction.

The same is true for manufacturing. Much of the manufacturing section within Subparts E and O are related to those same things. The quality assurance, the need to have programs in place, and so forth.

I should have mentioned, this is the first, the first one we're going to have but this is as Jordan mentioned, a place where we have a common preamble.

Because the Subparts in E and O are very

similar, again you just have differences in some terminology. And, some differences in internal references.

And as Jordan mentioned, you really are faced with the choice of having repetition, which might make it longer versus within the Subparts, having multiple discussions of how it's applicable to one Framework or another Framework.

How it, how references are to here to there, and to answer the previous question, we did look at this a lot and made a conscious choice that repetition has its downsides, but it was preferable over having relatively complicated language.

Because you were pointing back and forth between, between the frameworks and having multiple references.

Because we were trying to reinforce what Jordan mentioned earlier. These are distinct Frameworks.

And, so this is just another way to, to reinforce that once you're in, or once you've elected to use Framework A, then those Subparts are the ones that you're going to be referring to.

Likewise, if you're in Framework B, you're going to be in, in this second set of Subparts.

The one thing that --

(Simultaneous speaking.)

MEMBER PETTI: Hey Bill?

MR. RECKLEY: Yes, go ahead, Dave, sorry.

MEMBER PETTI: Just a comment. You know, we had commented on the length of the Rule, and you know, we've seen your reconciliation, your response, if you will.

I'm beginning to believe that this is a case where you're stuck between, the staff is stuck between a rock and a hard place.

There's no easy way. And it, yes it's shorter, I'll agree with that. But it just may not be short enough for some stakeholders.

And, that's, you know, that's sort of where you are. So.

MR. RECKLEY: Yes, no, I agree with you that there's, I mean there's tradeoffs. There's, we don't disagree with people when they make a comment, but there are tradeoffs.

And, we were forced to make some. And make some choices. And, so we picked what we thought was, was best.

And for example, in regards to rather have repetition or multiple internal pointers. And, so.

The other thing I would suggest to people is Rules. When we're looking at it now, it's kind of like a novel.

But once things are in place, people don't read the Rule anymore from beginning to end. They go to its section and they want to know, what is the requirement for the activity that I'm working on today.

So if you look down the road, you know, 10 or 15 years, that was another thing that we had had in mind was that the length is a secondary thing to clarity, when you look at it in that respect.

So, but again, it's not a right/wrong answer, this is just, you know, we were faced with a problem and we, we made a selection as to which way we were going to go.

The one thing that is different in manufacturing from the summer to, to this most recent revision, is we always had placeholders in place to talk about how we would address the loading of fuel in a manufacturing facility, and then the transport of the reactor module loaded with fuel, to a site.

And so we put effort into that, and this most recent revision and both Subparts E and O address that.

So if we go to the next slide, Billy.

MEMBER PETTI: I'm not sure. Did we go to slide -- there we go.

So, the requirements in Framework A are 620D or delta, and in Framework B it's 5341.20D. And it lays out the requirements for the loading of fuel into a manufactured reactor module.

And, the dilemma that we faced, and I think we might have talked about this before, was you basically have a reactor at that, at that point.

And we have requirements both in our Regulations and history, and also within the Atomic Energy Act, of what makes a utilization facility.

And if you call it a utilization facility, what other things come into play?

And so for example, if the loading of fuel by itself into the manufactured reactor module was deemed to make that module a utilization facility, then we're going to have to have a combined license to support that operation, just like you need a combined license or an operating license under Part 50, to load fuel into a reactor.

So, after a lot of thought and a lot of work, we put in place a technical requirement, which is that in the manufacturing facility you would have

at least two independent mechanisms that can prevent criticality, should optimum conditions be, should you have an event that, that gives maximum moderation, for example, or maximum reactivity.

So two independent systems to keep you subcritical. This is generally consistent with the double contingency in Part 70.

But if that is in place, then what we're saying here is the Commission is finding, and this is relatively important and we'll point out in the paper, this is an area where the Commission is making a finding as part of this rulemaking, that that manufactured reactor module is not a utilization facility.

That means we can address it through largely the Part 70 requirements that, that are in place.

The manufactured reactor module becomes a utilization facility when it's delivered to the site, and the Commission makes all of the ITAAC related findings associated with the manufacturing license, and the combined license at the, at the site to which the module is being delivered.

And, then that allows at the site, once we make the ITAAC findings for the license, the COL

licensee to undo these protections, such that the module, excuse me. Such that the module can be operated.

So I know this is a, you know, it's a combination of both technical and legal hoops that we're defining but again, it's a relatively important thing.

Because this is a new thing we're adding to Part 53, both Frameworks, in order to support what we've learned is a possible deployment model for smaller reactors, for the micro reactors, that Jordan mentioned earlier. Or, Joy, someone mentioned.

So this is what one of the just a couple things I want to do. One of the ones that is new from what we released in the summer.

MEMBER REMPE: So, Bill? This is --

(Simultaneous speaking.)

MR. RECKLEY: Yes, go ahead. Joy?

MEMBER REMPE: Oh, okay. First of all, I think I'm going to paraphrase your words. The reason why you have this prevention of criticality is to avoid having to have licenses for operators at that facility, and so it doesn't become a utilization facility.

Is that what I'm paraphrasing and taking

away from this discussion?

MR. RECKLEY: Oh, it would not only be operators, but if it is a utilization facility, then the Atomic Energy Act would, would bring into play a number of provisions under the Act.

Operators, but we'll talk about operators, given that we're introducing another transformational thought through the generally licensed reactor operator.

But we were able here to just limit it to a fuel handler requirement. And, it's more --

(Simultaneous speaking.)

MEMBER REMPE: -- subcriticality testing?

MR. RECKLEY: We are working on that element, and it's we're going to have some, at least some questions in, in the rule package to try to enable us to perhaps expand it to allow that.

But that's another hurdle. And, so every time you introduce a complicated again, both technically and legally, it's a challenge. And, we just weren't able to do that within the time frame.

So, but we recognized that is a potential interest and we'll have some questions, at least we'll have some questions within the, in the Rule package.

MEMBER REMPE: Thank you.

MR. RECKLEY: Okay, Billy, if, or Derek, or someone, did somebody else have a question?

MR. WIDMAYER: Yes, Bill, it's Derek.

And I think that you answered partially, because you said you were going to have some questions in the rulemaking package.

But I was kind of surprised to see the word mechanism. You know, I was sort of kind of expecting functions.

I don't know if you were thinking about something other than functions, as far as how to prevent criticality.

MR. RECKLEY: Yes, we just wanted two independent and diverse means to do that. I won't get into.

If there, there might have been better ways to word it, but that was the thought that we were going after.

MEMBER PETTI: Yes, I expected to see two independent and diverse means, because that seems to align with criticality, the thought process.

MR. RECKLEY: Okay.

Yes, okay, we'll take a look to see. And I'll be honest, I don't remember if I was pulling that out of somewhere else or not, for consistency.

But we would want to be as consistent as we can with requirements in Part 70, and elsewhere. So, we'll take a look at that language.

I think technically, we're all on the same page, but we'll take, we'll take a look at the language.

MEMBER REMPE: And is --

(Simultaneous speaking.)

MEMBER REMPE: Go ahead, Dave.

MEMBER PETTI: I just, you know, in your preamble you're asking a lot of input from the public on, on this area in particular.

MR. RECKLEY: Right.

MEMBER PETTI: And, you know, my view is prudency is best. This is a really new area, not a lot of experience.

Going slow is I think the right thing at this point. So just one member's thoughts.

MR. RECKLEY: Okay, thanks, Dave.

MEMBER REMPE: And along those lines, one of the areas that I don't think you've still decided, are what to do about bringing back the module.

And again, sometimes we've heard oh, the requirements are all there in Part 70 or wherever, but it sounds like there are some issues still as

evidenced from this addition into Part 53, right?

MR. RECKLEY: Right. We say that we didn't look at the back end. It has to be basically addressed, but Part 53 addresses the decommissioning of the site, but it does not address the potential refurbishment of modules, or the use of the module as a waste container itself.

So, there are rules in place that would need to be addressed, and we think we could handle that within the existing rules, should it come up before we're able to make the adjustments ahead of time.

MEMBER REMPE: And as I recall, one of the issues that we raised was well how many modules are allowed, and where would the guidance be for that so you don't have a parking lot of spent modules when you don't have a place to ship it back to.

And, the staff actually had a good answer in the response to our letter, but that's not probably the best place to have guidance on how to address that topic.

And, is there going to be an effort to try and maybe develop some guidance for these modules, for manufactured reactors that helps --

(Simultaneous speaking.)

MR. RECKLEY: Yes, I do --

MEMBER REMPE: -- all these requirements?

MR. RECKLEY: I do think this would be an area where future guidance, once we're a little more clear what direction things are going to go, that this would be a logical place to develop some more guidance.

MEMBER REMPE: I agree. Thank you.

MR. RECKLEY: All right, slide 15, Billy.

So Subpart F addresses basically like configuration control and maintenance for equipment, and then it has requirements for operational programs. Those we really did not change very much.

We shortened up facility safety program, but by and large, it remains the same kind of a concept.

We had given it some thought, and took out some of the detail that might be addressed in guidance and sharpened up the criteria. But again, high level and very similar to what we provided before.

The bolded text here, and we're going to talk all of tomorrow morning about staffing and operator licensing, and the, and the thought of a generally licensed reactor operator, and human factors engineering, and all of that will be talked about in

the morning.

So by and large, Subpart F other than the staffing and human factors didn't change much.

MEMBER PETTI: Bill?

MR. RECKLEY: Yes?

MEMBER PETTI: Just another question.

There are some who are arguing that there's an increased level of regulation here, through the programs.

I always understood them as compensation in some cases for lack of operating experience, for some technologies that have never been built.

And, I know you're asking in the preamble for feedback in some of these specific areas, like facility safety and the integrity assessment.

Is that, you know, as I just captured it, is that a fair characterization?

MR. RECKLEY: Yes, I think we've gotten that feedback. The actual if you look at the list, the only thing you won't find in Parts 50 and 52 are integrity assessment, and facility safety programs.

MEMBER PETTI: Right.

MR. RECKLEY: And integrity assessment, you just sometimes you need to be a little careful as to say what, what are the regulatory requirements.

Will you find the need for integrity assessment programs in Parts 50 and 52? No.

Do licensees have the equivalent of integrity assessment programs through things like the BWR vessel internal programs? The PWR materials programs that were put in place to meet other regulatory requirements?

Or to address issues that had came up during the operating lifetime, like intergranular stress corrosion cracking? Yes, they do.

So, is it a new program in the Rule? One might argue. Is it a new program that, that would be foreign to licensees? You know, my own personal opinion is no, they have these things. So.

MEMBER PETTI: My opinion, I mean you're asking in the preamble for comments from the public, and we're going to take if I get my way with the rest of the committee, we're going to give you some comments on these, as well, figuring that you probably want to hear.

And in this area, this makes a lot of sense. I mean we are using corrosive, some coolants that are very aggressive.

And, if we don't take advantage of what we've learned from the existing fleet, it just seems

to not, you know, it just seems almost, just uninformed engineering to not do this given, you know, water had problems, what do you think some of these chemicals are going to be like?

This is the, you know, very smart thing to do for the advanced systems, I think.

MR. RECKLEY: Well, the other area going back, you know, to what I mentioned before of a performance based approach. Performance based approach always has a monitoring function.

And, so I just look at this as a, as the performance monitoring function of what was put in place in, in the design section.

So anyway, but like you say, to some degree, it's, it might be the way it's organized but we, we did ask for comments and so we'll see.

And to your point, we would certainly appreciate ACRS observations on this, and in every other area, so.

MEMBER BALLINGER: This is Ron Ballinger. Doesn't Section 11, Division 2, pretty much require this?

MR. RECKLEY: That's a new addition and we've looked. I'm not an expert on the REM.

MEMBER BALLINGER: Yes, yes, I mean that's.

MR. RECKLEY: But it does, we were aware of it and as we were building this, we were looking at REM and saying hey, that would be a vehicle to address this type of a requirement. So, yes.

MEMBER BALLINGER: But it's not a, it's a -- if you're using Section 11, Division 2, it's a requirement.

MR. RECKLEY: Right. But it would be, yes, but by following that code and standard, that would be a way to meet this regulatory requirement.

We don't, Part 53 and especially Framework A, we don't call out specific consensus codes and standards to use.

We encourage their use, but you're exactly right. By using that, that might very well be a way to meet this technical requirement.

Okay, Billy if we can go on to.

MEMBER PETTI: Hey Bill, just want to let the members know that I'm hoping Bill can get through his part before our break.

I know we're running, we've been going here for a little bit. So, keep going.

MR. RECKLEY: I think we can get through Framework A and then we can take a break, Dave.

So, especially since most of these are in

areas that we didn't change very much. So, G and Q were the decommissioning requirements.

Again, this comes out of 50.75 on decommissioning, and 50.82 on the termination of license. Nothing really changed from what we had released in the summer.

So if you want to go to slide 17, Bill. Subpart H.

Again, in Framework A, we didn't change much in Subpart H. And, just we highlighted here just to reinforce that the way Subpart H is laid out, the siting related information that would be in applications, is defined under the early site permit section.

And, then construction permit, operating license, combined license requirements refer back to the early site permit, for the information to be provided.

And likewise, on the plant design, we used the standard design certification as kind of the base, or starting point for what information would be provided on the design.

And, then within the other sections would make slight adjustments to it. For example, under construction permits, just recognizing that you would

not need to have, but just the recognition that you're in a different place when you apply for a construction permit, than under a standard design certification.

You might still have research and development going on to prove the performance of a particular system, for example.

But the information and the need to describe the systems, refers back to the standard design certification as the base.

But we also as I mentioned, we really made no major changes to Subpart H, from the summer to this most recently released version.

So, Billy, if you want to go to 18.

Subparts I and S, likewise, some changes if we, for consistency between I and S, which are the two Subparts in the two Frameworks for maintaining licensing basis information.

All of the processes for doing license amendments and so forth were taken out of Parts 50 and 52.

Some changes in the equivalent, for example, to 5059, and that's an area that we continue to interact with stakeholders.

And in particular, there's a DOE industry cost-shared activity looking at some of this change

control mechanism, along with the content of applications guidance that Jordan mentioned.

But no significant changes from what was released in the summer.

So, if we want to go to J and T, Billy, next slide.

Subparts J and T reporting administrative requirements, such as financial requirements, reporting unfettered access, and so forth.

These were basically just a collection of various requirements taking from Parts 50 and 52. Greg, you had mentioned the immediate notifications and licensee event reports.

We took those primarily. We know there's another rulemaking being contemplated in response to a petition for rulemaking.

Just like in some other areas ongoing rulemakings, we will have to see where they go, and what impact they have on Part 53.

By and large, our approach was to take from, where we were trying to provide a comparable requirement from 50 or 52, we took it from, from 50 and 52 and acknowledged that another rulemaking may be in play.

And, you know, another thing that we can

do in that area, is to put in a request for comment or a question in the FRN in section 7. And, we do have one of those for reporting requirements.

And, that brings us to the last one, Billy, if you want to go to slide 20. This is the quality assurance requirements in Subparts K and U.

And, so that slide basically has the column going down the other side showing that except for some minor wording changes to address terminology for example, in Framework A, we don't use the term important to safety.

They are the equivalent to the Appendix V criteria, and so we maintained that close relationship in both, both Frameworks, and Subparts K and U.

So, and no changes from what was released in the previous versions for either Framework in that, in that area.

So, that brings us to the end of Framework A, in terms of a summary and where we introduce some changes. Again, just a couple changes since what we had released in the, in the previous iterations in the summer.

So Dave, I think if you wanted, we could take a break here, and the Bill Jessup can pick up Framework B. And, then we can finish out the

discussion.

MEMBER PETTI: Okay.

Joy has a question.

MEMBER REMPE: Yes, and I apologize I didn't get this earlier, but I, when I was looking at the preamble, I got a little bit confused. And, help me understand.

Is anything changing with respect to what the requirements are for a standard design approval, with Part 53 and finality of it?

And, it was a little confusing to me when it was referencing the NIA report. Could you help me out a little bit in understanding what you're trying to get to here?

MR. RECKLEY: We're not proposing to really change the standard design approval from what's available in 50 and 52.

We tried and the reason to reference the Nuclear Innovation Alliance report, was that the use of the standard design approval for a major portion, remains somewhat of a, of a new concept.

It's in there now, it just hasn't been used. We've only done a couple standard design approvals, and by and large, they've been for the complete design, not for a major portion.

That report even under 50 and 52, tried to clarify how it might be used for a major portion. And, we were just trying to carry that forward in the progress that we had made in that area.

But it's not really any different than under 50 and 52.

MEMBER REMPE: So if someone has an application for an SDA, and then they were to come in subsequently with a Part 52, or a Part 53, there would still need to be some additional review that's more than the site specific characteristics.

And there's no reason to assume that the process, that just because you have, I mean there's no finality with an SDA, and so --

(Simultaneous speaking.)

MR. RECKLEY: Well, the finality with the SDA is limited to you, and us, ACRS and the staff. The Commission doesn't weigh in on a standard design approval.

But the finality afforded is that those of us looking at the technical requirements should stick to our previous finding unless new information is provided.

Unless they change something with which obviously would kind of call into question the value

of the standard design approval.

Or if we change our minds, in which case we need to go to the EDO, the Executive Director of Operations, and explain why we don't want to abide by our previous finding in this, in the approval.

MEMBER REMPE: Okay.

And, okay, this helps in understanding what you're trying to get to here. And, thank you.

MR. RECKLEY: Okay.

MEMBER PETTI: Hey Bill, just one more comment.

You know, we've heard a couple questions today from members responding to some other comments out there about, you know, this changing the bar.

You know, it's more restrictive regulation, or more, you know, over-regulation. This, the comment relative to the programs.

It just seems like maybe a few more sentences in the preamble to try to head this off so that it's out there in the preamble, might be worth thinking about to be more explicit.

MR. RECKLEY: Right, okay.

MEMBER PETTI: Okay.

MR. RECKLEY: Point taken, point taken.

MEMBER PETTI: Thanks.

Okay, let's break. We've been going at it. Let's go till ten minutes to the top of the hour.

So, at 10:50 Eastern we'll be on break.

(Whereupon, the above-entitled matter went off the record at 10:27 a.m. and resumed at 10:50 a.m.)

CHAIR PETTI: Okay, we should all be back.

Bill, are you ready to go with Framework B?

MR. JESSUP: Great. Thank you, Dave.

Yes, this is Bill Jessup from the NRC staff, and I am ready to go.

So, good morning, everyone, again. Welcome back.

Like I said, my name is Bill Jessup. I'm Chief of the Advanced Reactor Licensing Branch 1.

I'm going to cover Framework B, and that is just the balance of Framework B. Jordan walked everyone through Subpart A, common to both Frameworks this morning, and Bill Reckley already covered the Subparts in Framework B that are very similar.

So, I will try and get us back on schedule. I've only got three slides to focus on here.

So, Billy, if you could go to the next

slide for Subpart N? Thank you.

So, Subpart N, when we last met with ACRS in the summer, we foreshadowed the development of a Subpart dedicated to siting requirements in Framework B. Initially, as you'll recall, Framework B gave a cross-reference to the requirements in Part 100 for siting. We recognized there were some weaknesses in that approach.

And so, what we've come up with here is Subpart N, and it's new in the sense that it didn't exist the last time we met and in the first iteration of the Framework B preliminary proposed rule text. However, it is largely derived from some of the existing requirements in Part 100.

Subpart N is a fairly compact set of requirements for siting, and I've actually only highlighted one section here in Subpart N, that section being 53.3525, Geologic and Seismic Siting Criteria. That's really the only substantive difference when compared to Part 100. All the other sections on the slide generally align with Part 100. However, they are in Section 3520, 53.3525.

We worked to broaden the proposed requirements here, specifically, relative to ground motion response spectra. And this relates closely to

the seismic design requirements that I'm going to touch on in a couple of slides.

So, Section 3525, and if you look at paragraph 53.3525(c), you'd see it would rely on the development and use of ground motion response spectra. And that's defined in 53.3510.

The current wording, if you look in Part 100, the requirements, the analogous requirements, are "determination of the safe shutdown earthquake ground motion," SSE ground motion. What we've done is we've changed that to "determination of the ground motion response spectra."

And the key here is that the ground motion response spectra would be used to either develop the safe shutdown earthquake ground motion as it is today for applicants using Appendix S to Part 50 or multiple design basis ground motions, if an applicant were to pursue the seismic design alternatives under 53.4733. That's a new section, again. I'll touch on that here in a moment.

So, again, really, the only difference is that we've broadened out the requirements relative to ground motion, and they can either be the existing safe shutdown earthquake ground motion or multiple design basis ground motions. And I'll draw a

connection between those concepts when we talk about Subpart R. So, again, that's really the only primary difference here between Part 100 and what you see in Subpart N.

Billy, could you go to the next slide, please? Okay. Thank you.

So, Subpart P, these are requirements for operation. I'm kind of following a similar format to what Bill Reckley did in the previous presentation. I'm just highlighting the areas that have changed significantly from the previous iteration and the last time we spoke to ACRS.

As you'll see on the slide, and as you may have seen on Bill's slide relative to Subpart F, most of the sections here, they align very closely with those in Subpart F with a handful of exceptions -- environmental qualification of electrical equipment and primary containment leakage testing. Those are derived largely from their analogous requirements in Part 50.

I've highlighted some of the sections that have changed significantly, though. One is Section 53.4220. Those are the requirements for staffing, training, qualifications, human factors.

This came up earlier, and I only want to

highlight it because it's very short now. And it just tells you that all of these requirements are now in Framework A in Subpart F. And I know there's an entire session dedicated to that tomorrow morning. So, I'm not going to go into any great detail beyond what the folks will do tomorrow.

I just wanted to point out, though, that this is one of those areas where we've internalized the feedback we've gotten and worked to consolidate those requirements, so that now they are centralized and it did make the rule shorter. But it's unique. It was just one of the few areas where we felt like we were able to do that while maintaining a level of clarity and usability that we seek to preserve.

Under the programmatic requirements, I've highlighted fire protection. There's been a lot of stakeholder interest in this topic. What I would offer is that the fire protection requirements in Framework B, they've been significantly modified and streamlined compared to the first iteration, and they now really align with what's in Framework A from a structural perspective, the basic components, including requirements for a fire protection plan, a fire protection program, program performance criteria, and fire hazards analysis.

Through that streamlining and the updating that we've done to those requirements, we did resolve one of the comments or recommendations in the 4th Interim Letter from ACRS about ensuring that the requirements remain technology-neutral. So, that was an opportunity to kill two birds with one stone, but, again, highlighting an area that has changed significantly.

And then, the final highlight here is a new section. It's 53.4420, Mitigation of Beyond Design Basis Events. This section was added in response to some stakeholder feedback that we had gotten. Initially, Framework B, it cross-referenced the existing requirements in 50.155 for mitigation of beyond design basis events, a more recent set of requirements.

We appreciated the feedback that called out that some of those existing requirements may not be technology-inclusive. So, we went back, evaluated the bases for what's currently in 51.55 and tried to develop a set of requirements that parallel that, but are technology-inclusive.

An example would have been, you know, if you look in 53.4420, we did modify some of the damage states. If you look in the existing requirements,

some of the damage states, they're very light-water-reactor-specific. And so, we've tried to come up with a more generic set of damage states, those that would challenge the safety functions at the plant.

So, again, these are really the only major changes to Subpart P that have taken place since we last met. Otherwise, very minor changes to other sections; the administrative process another one is.

Billy, if you could go to the next slide, please? Thank you.

So here, this is Subpart R. This is kind of the last generic slide I'm going to go over for Framework B.

Just as a review, Subpart R, it mirrors Subpart H and Framework A. They both were directly covered in the last presentation.

Many of the provisions, especially the process-related ones, are equivalent between the Frameworks when you put them side-by-side. And we actually did put them literally side-by-side over the summer to ensure that there were no provisions that were misaligned where they shouldn't be.

I've highlighted two sections that have undergone some changes since the first iteration of the preliminary proposed rule text was issued and we

last met with you all.

Section 53.4730, this was discussed at length with the ACRS back in June and July of this year. And this section contains most of the technical requirements in Framework B in the form of application requirements. I alluded to that this morning, and I know we had significant discussion on that over the summer.

It's undergone some changes I'm actually going to discuss in some detail in the next session. I just wanted to highlight it here to flag its importance and to note that, again, we will talk about some of the key changes in the next presentation that's coming up.

The other section I've highlighted is Section 53.4733. This is a new section that goes along with the siting requirements in Subpart N that I was just describing. While it's new for Framework B, conceptually, it's very similar to what has previously been presented in Framework A in Section 53.480. Those are the seismic design requirements in Framework A.

Here, as the section title suggests, these are alternatives -- very similar to, actually, the section title above it, the risk-informed

classification SSCs that mirrors 50.69.

So, what we wanted to do here is to provide some risk-informed, performance-based seismic design alternatives. Those alternatives would be against the requirements in 10 CFR Part 50, Appendix S. The Appendix S requirements remain the baseline for Framework B applicants. But again, what we're proposing here is a set of risk-informed, performance-based alternatives for applicants that can develop sufficient risk insights, such that they could grade seismic performance criteria.

And again, they were developed in parallel to the seismic design requirements in Framework A, where those seismic margins, they're really developed consistent with the risk significance of each SSC within the risk-informance goals. Essentially, this would permit a graded approach to seismic design based on the risk significance of a given SSC.

And so, again, I want to draw some line-of-sight back to Subpart N. So, if you're pursuing the baseline requirements in Part 50, Appendix S, you would use that safe shutdown earthquake ground motion that we are familiar with today. If you pursue these alternatives under Section 53.4733, you would go kind of to the other fork in the road in Subpart N, and

instead of developing a single safe shutdown earthquake ground motion, you would develop multiple design basis ground motions. And that would allow you to kind of grade the seismic design requirements using what's here in 53.4733.

We're in the early stages of developing implementing guidance for this alternative. So, developing the guidance for how to effectively risk-inform and categorize SSCs in this Framework, that's going to be one of our key focus points for this.

But I did want to call it out. It is a new alternative, not unlike several risk-informed initiatives that have been implemented previously. And it would rely on some risk information to be provided by applicants.

So, that's all I had for Framework B. I don't know if you want to stop.

CHAIR PETTI: Yes. Bill, I had a question on the seismic.

So, it's allowing greater flexibility in design, as I sort of look at it. And it's something that fits in the philosophy of Framework A, but you wanted to give some optionality, if you will, to people using Framework B, to give them some flexibility.

Because it's a huge cost driver, you know, in plants to seismically harden. And as I understand it, potentially, excessive margin using the existing rules, and this would allow a more sophisticated analysis this risk-informs and still provides adequate margin. Is that a fair --

MR. JESSUP: That's correct, Dave. You know, if you look at it from a ground motion perspective -- and, Jim Xu, speak up, if you'd like -- but, just as you said, if you look at the existing requirements, you know, you're forced to consider that minimum .1 g peak ground acceleration. If you're able to grade those design requirements, then you move away from a single minimum deep ground acceleration to a more graded set of requirements. But, as I acknowledged, that does require some amount of information regarding the risk to the plant. Tech should get to that point, and I don't want to undersell that point.

MEMBER BROWN: This is Charlie Brown. Can I ask a question on the seismic part of this?

MR. JESSUP: Sure.

MEMBER BROWN: In developing this for Part B Framework, and giving this additional relaxation or flexibility to evaluate what seismic criteria they

need, was any consideration given to the North Anna seismic event, which I live in McLean, Virginia. That's fairly far away. I watched my house rattle. In terms of, what were the results of the inspections that were done at North Anna and relative to the actual size of the impact at the site itself in terms of developing this, quote, "more flexible" approach to evaluating what seismic displacements you have to consider?

MR. JESSUP: That's a good question, Charlie. I would ask that Jim Xu speak specifically to whether the operating experience in North Anna was factored in, has factored into this approach overall, and not just for Part 53.

But what I can say is that the baseline requirements that exist today, they remain in Framework B. As you mentioned, this is a relaxation, provided that sufficient risk insights are available. And I say that because a lot of where we're going, it acknowledges that we are at this time able to develop greater risk insights about the plants and what's significant.

And so, I think, if I compare a plant like North Anna that may not have had those tools around at that time, that is a difference, but I think you're

pointing out that that's bosch, then, maybe; that North Anna withstood it so well, perhaps because it did have all that margin. Is that what I understand?

MEMBER BROWN: That's exactly my point.

MR. JESSUP: Right.

MEMBER BROWN: I mean, from what I live, I'm quite a distance away, and my house suffered no damage. Several neighbors, their chimneys fell apart. So, they didn't fall apart; they cracked. They had to be redone and reworked. And obviously, chimneys are an outlier. North Anna doesn't have a chimney like that per se.

It's just seemed to be it was a great data point to look and see, yes, the requirements stay the same, but when you give flexibility to evaluate stuff, that's a near-term actual occurrence of a plant riding through, and it was amazing how they were back in operation almost immediately. I say that figuratively, not explicitly. So, it seemed to be a good data point. That's why I asked the question.

MR. JESSUP: Yes. No, I appreciate it. I was intimately involved with that effort and felt it as well.

So, I don't know, Jim Xu, if you're on and if you have anything to add relative to how operating

experience has been considered --

MR. XU: Yes.

MR. JESSUP: -- you know, as we're working to develop this methodology.

MR. XU: Yes, sure. Yes.

This is Jim Xu. I'm Senior Technical Advisor out of Research.

In terms of this alternative, I mean, this is really a goal we have to provide more flexible design options when they occur, kind of a broad-brush approach for seismic design.

So, the operating experience in North Anna, obviously, is part of the consideration. And the plant restarted very quickly, obviously, performed very well under that particular scenario. And we understand that the technical issues behind why it performed well, right? So, yes.

But I think the seismic design alternative under Subpart A -- or Subpart R, it's very similar to Framework A, the alpha. And I think it's all a graded approach. It gives more flexibility to a designer to design the SSC in accordance with their safety contribution to the system, rather than design all of the safety-related to the same standard, right?

But, as to the challenges, what is the

safety criteria for determining the adequacy of that design? I think that's still a challenge to us. For Framework A, we have a quantitative safety criteria we can use to judge the adequacy of the design. For Framework B, we should rely on principal design criteria. I think that gives us some challenge because the principal design criteria are qualitative, and yet, if we want to rely on qualitative design criteria, we need to have some qualitative or quasi-qualitative acceptance criteria to assure that the design meets that qualitative principal design criteria. I think that remains a challenge to us, and we're going to work that out in the future.

Thank you.

MEMBER BROWN: From the question I asked, I presume there were measurements taken at North Anna. Was it below their design criteria by much? Or a lot? Was that --

MR. XU: Yes. No, it was on the high side of the safety margin in terms of the seismic, I mean. And also, if you look at the exceedance from middle Virginia events, which are mostly in the high frequency range, you know, I mean it cannot really affect the performance of most safety-related safety system components. I mean, that plant performed very

well under that particular earthquake event, yes.

MEMBER BROWN: So, I presume, then, what you're telling me -- I'm trying to work through your discussion -- is that the actual measured seismic data was well within their design criteria? Is that a --

MR. XU: Yes, that's correct.

MEMBER BROWN: When I say, "well within," somebody made the comment, I think made the comment a minute ago, it was very conservative. Was it way conservative or half the criteria or -- I never heard any results from that.

MR. XU: I think it was conservative with respect to the margin --

MEMBER BROWN: So, that's why I ask. Pardon?

MR. XU: I think it's conservative with respect to the design margin for the North Anna.

MEMBER BROWN: By a lot or just a little?

MR. XU: You know, I think the margin is significant enough to, you know, I mean, to ensure the good performance of that plant. I mean, there are no vulnerabilities from a seismic perspective, at least from our investigation, you know, after the earthquake.

MR. BLEY: Charlie, this is Dennis.

MEMBER BROWN: Yes?

MR. BLEY: There were some parameters that were outside, but nothing was close to damage. There was a really interesting Commission meeting with the staff and with the people from North Anna and EPRI folks on this. I don't know if that's still available as an archive, but if it is, you'd find it really interesting.

But, yes, the plant was pretty far away from any significant damage, but some of the parameters were outside of the design basis, but not in a way that challenged anything.

MEMBER BROWN: Yes, I just -- obviously, that's one of the significant things we have to deal with, if we want to be able to site these things around the country.

MR. BLEY: Yes. Just a point. I was at Woods Hole in Massachusetts and felt it up there. But, still, feeling it is a lot different than causing damage to equipment designed for earthquakes.

MEMBER BROWN: Yes, but it's kind of a testament to me that maybe people could say, "Well, gee, you're overly conservative." Well, this is another one you don't want to throw out the baby with the bath water -- that's all -- in terms of

flexibility-type things.

If you do something less, build it a little less structurally formidable, how much does that really save you in terms of really preserving the ability to continue to operate that plant for 60 years, and then, maybe even 80 years?

That's all. You answered my question. Thank you.

MR. XU: Thank you.

MEMBER HALNON: Yes, this is Greg.

I've got a question, back on, I think, 4420, the Spent Fuel Pool Monitoring that you put a site number in there of five years of elapsed time for the monitoring. That feels like a legacy number. What is the real criteria? Is it to be able to air-cool the most limiting fuel?

MR. JESSUP: Hey, Greg, I understand your question. There's an echo. I understand your question. That number did come from 50.155. What you've said about air-cooling, that sounds reasonable, but if you'll let me take that back? I don't have -- I haven't read the final rule and the preamble discussion that was there. So, I don't want to answer right off the bat.

MEMBER HALNON: Okay.

MR. JESSUP: But I know it's in there.

MEMBER HALNON: Yes. I should have gone to the preamble to see if my question was answered. But it just feels like a legacy number and that maybe we could get more flexible by saying what the real criteria is by analysis for the most limiting fuel assembly, and geometry needs to meet X, rather than just an arbitrary five years. Just it would be more technology-inclusive, I think, if you could put the actual criteria in.

MR. JESSUP: No, it's a good comment, and I was actually referring to the preamble or statements of consideration for 51.55.

MEMBER HALNON: Oh, okay. Okay.

MR. JESSUP: Yes.

MEMBER HALNON: Well, I certainly didn't do that.

MR. JESSUP: Yes. I did, but it's been three or four months. But let me take that back now.

MEMBER HALNON: Okay.

MR. JESSUP: Dave, I think, just coming back to your first question, I just wanted to point out that there is a Predecisional Draft Guide on the technology-inclusive, risk-informed, performance-based methodologies for seismic design that supports what's

going on, you know, that supports this discussion and the proposed requirements. And I think that we would expect that would come to ACRS as part of a future interaction. So, I just wanted to point that out. And it is out as a draft, publicly available now.

CHAIR PETTI: Thanks.

MR. JESSUP: Okay. Thanks.

Billy, you can move to the next slide, and I'll turn it over to Bill Reckley.

MR. RECKLEY: Thanks, Bill.

So, the next few slides will talk about safety analysis and, in particular, the use of the Qualitative Health Objectives, or QHOs, and then, Boyce Travis will talk about the safety analysis in Framework B.

So, Billy, if we want to go to the next slide.

Just as background, it's been interesting, ever since we have tried to develop Framework A. And just as background, under the bullets there, "existing paradigm," we have a system in Parts 50 and 52 that has evolved since the '60s. And basically, on a few occasions, the question of, well, what is adequate protection or how is it defined has arisen. And the Commission has largely said, "We're not going to

define it in technical terms."

But, given the evolution of the requirements, along with the technology in the '50s, '60s, and '70s, all the way up to the current day, the election of all of the requirements that have been put in place provide, or can be presumed to provide or assure, adequate protection at a minimum.

And so, that kind of establishes that, through experience, we're comfortable, but it's not defined in technical terms. And you have to look at all the requirements that are in Part 50 and in other parts of NRC regulations and various ways that the NRC has imposed requirements.

And then, in addition to that, the Act provides, the Atomic Energy Act provides, that the Commission can, as it deems necessary or appropriate or desirable, take additional measures to protect the health or minimize danger to life or property.

So, those are the two things in the Act, Section 182 and Section 161 of the Act, that kind of define what the NRC is obligated to do and authorized to do. And so, if you're going to come up with a new Framework and you're not simply going to bring over those existing requirements from all of Part 50 and elsewhere and kind of do a like-for-like replacement,

then you have to do some exercise to say the two Frameworks are providing a comparable level of safety.

And that's been a challenge, and you can see in the rulemaking plan it was laid out as one of the objectives that we would in Framework A generally provide a comparable level of safety, as current plants and new plants licensed under 52, and then, provided a few other objectives in terms of the stability; accommodate various technologies, and allow those technologies where they can show they have attributes from the Advanced Reactor Policy Statement to take advantage of them.

And this kind of goes back to a comment Joy made earlier. An advanced reactor is, likewise, depending on where you want to look and what you want to define, we've used that term ever since the Advanced Reactor Policy Statement. So, it's to some degree any reactor that's probably beyond generation two, if you look at the timing of that.

The difficulty -- it's not a difficulty -- but the attributes of the Advanced Reactor Policy Statement, and the Policy Statement acknowledges this, plants can have, some of them, maybe all of them -- and how you judge it is based on the merits. And you have to run it through the system, be it Framework A

or Framework B, for that matter. And so, that's the reason we got away from that terminology.

Even large light water reactors can have attributes from the Advanced Reactor Policy Statement. Obviously, the newer plants have much more passive safety systems. That's an attribute of the Advanced Reactor Policy Statement.

So, I'm going off and rambling a little bit. The gist of what I was trying to get to on this slide is that a challenge we've recognized from the beginning is, how do you develop a new Framework and compare it to the existing Frameworks when they're not defined in numerical terms? And so, that's been the challenge, and we've gone through various exercises to try to convince ourselves and the ACRS and stakeholders that we have achieved that.

So, Billy, if you can go to the next slide.

This is just some of the figures we've used in the past to try to talk about taking an integrated approach. And that, basically, is how we were looking at the development of Part 53. It's why we defined it for the life cycle of a facility. It's how you, in the bottom figure, that bowtie diagram that we used many times early on that shows the scope

of what's addressed through the Licensing Modernization Project, the events analysis, the assessments of the plant.

But you can see again, or remember from the bowtie diagram, it didn't take it to the next step and talk about things like how that analysis would be used in siting decisions, for example. So, that was one of the things we did within Part 53, is to fill out the rest of that bowtie diagram to say how the LMP, as a foundation, would support the other decisions.

And in many cases, those things are specifically defined in other NRC requirements, like Part 100 for siting or the emergency planning provisions in Appendix Z to Part 50, for example.

The other figures are just the figure we used many times to talk about the mechanistic source term kind of approach that we were taking, and which is kind of necessary for non-light water technologies because the system that we have in place has been really built on the established barriers for light water reactors -- the cladding, the coolant, the containment.

And some designs may have a different set of barriers. And so, you need to have somewhat of a

different approach to achieve the same goals, but you have to recognize that you're going to look at it and analyze it differently.

And then, the last one is just a representation of a general evolution from active systems to passive systems. And increasingly, what we're seeing is a desire to even more so base it on inherent characteristics of plant features.

So, again, this is just kind of background that we've been looking all along to take an integrated approach. It kind of was a eureka moment for me. I was like, what's another way to talk about integrated decisionmaking?

So, Billy, if you go to the next slide, we have a whole process on risk-informed, integrated decisionmaking. And that is Reg Guide 1.174, developed shortly after the NRC's Safety Goal Policy Statement and the introduction of QHOs. How do you consider risk-informed insights into the decisionmaking?

And so, I looked at the five boxes that have been established and really haven't changed since the initial -- we've provided more detail; we've enhanced them, but the basic structure is the same since the first issuance of Reg Guide 1.174.

What are the principles and how can we use this tool to look at Framework A, in particular, and say we, looking at it through another lens, have confidence that we're ending up in a comparable level of safety?

And so, if you go around the wheel here, at the top is defense-in-depth, and that's stressed in Reg Guide 1.174, and I think it's stressed in both Frameworks, but, in particular, we're talking about Framework A. It is stressed in Framework A that measures have to be taken to ensure that you have defense-in-depth.

The next one, going clockwise around, is maintaining that the systems have adequate safety margins. And this goes directly to what Charlie was talking about just a few minutes ago at North Anna in terms of the seismic design. Why did the plant survive that event? Because it had safety margins.

And within Framework A, we have a whole section in Subpart C on design requirements. Part of those are to ensure that the systems, the safety-related systems, have design margins in terms of their use to make sure that the design basis accident meets the safety criteria in Subpart B, which is very similar to the Part 50 approach.

So, it's easy to kind of say, in that arena, there's differences. I don't want to downplay the differences in the DBA, but, in large part, you're achieving a comparable level of safety when you're looking at it in an integrated way. So, this is the caution: if you take the DBA from Framework A and the DBA from Framework B or from Part 50, there are subtle differences. And so, you can't say the DBA is the same in the two. But when you look at it from an integrated point of view, they're playing a similar role, and, in particular, the role they're playing in Framework A is to ensure that you have design margins in the system or systems that you're relying on for the design basis accident.

And then, you have a number of other specific design requirements in Subpart C, in particular, 53.440, that talks about following consensus codes and standards; making sure that you have proven the capability of each SSC you're relying on by doing testing, analysis, and prototype testing; the same thing we have in Part 50 under 50.43(e).

So, just looking at it again as an integrated decisionmaking, we think we have this box addressed. Then, you go to the next one, going clockwise, in Reg Guide 1.174. It's used in a risk

metric, and the risk metric that's used in both 1.174 and in Framework A is the QHOs.

Now, albeit 1.174 is written for light water reactors, and it relies on the surrogates because that's the way risk assessments have been done. So that it's looking at core damage frequency and conditional containment failures as the metrics because that's what's available, and that's what's been used. But 1.174 does talk about the QHOs and the light water reactor surrogates.

And that's important. Because you have a risk-informed approach, you want to have a risk-related metric to make sure that you're actually addressing the insights gathered from the PRA.

Then, the next one at like seven o'clock in the diagram, Performance Monitoring, critically important. We talked about this a little bit earlier. That's the programmatic requirements in Subpart F. It's the change control and other provisions in Subpart I. And so, in terms of performance monitoring, we think we have followed this general process of integrated decisionmaking to make sure that that feature of 1.174 is addressed.

And then, the last one is probably the hardest one. And that is 1.174, because it was

developed as kind of a change control mechanism, started with the existing requirement. So, this goes back to the original paradigm. We think adequate assurance is provided by the existing set of requirements. So, 1.174 starts with you're meeting the existing requirements, except as you've justified a change by consideration of these other boxes.

So, for us, basically, the exercise was to go through methodically and say, from a technical point of view, are we addressing the requirements in Parts 50 and 52 and 100? And Jesse and company will talk tomorrow about 55 for the staffing and human factors elements. Have we looked at that whole set of requirements and have confidence that we've addressed technically the subject matter? And again, we think we have.

You won't find the equivalent of, let's say, 50.46 and 2200-degree peak clad temperature in Framework A. You will find a requirement that the designer, since it's technology-inclusive, the designer or other party has to define what is the design feature they're relying on; what is the safety function -- you know, to address the safety function, and then, in turn, also propose what is their functional design criteria. So, we have the

requirement for them to identify the equivalent of the 2200 degrees.

So, again, you won't find the specificity in Framework A, but, as we went through and said, have we addressed all of the technical requirements that we think are relevant to a new plant, we think we did.

And so, this is just -- it's another way. To be honest, I wish I had kind of developed this argument and presented this before. We had gone through the exercise, but just hadn't shown it.

We, instead -- Billy, if you'd go to the next slide -- again, we were trying to explain it this way, and that was, in part, because we were trying to explain the top-down approach, where you end up in a similar place as you do, for example, if you start with a GDC; that starting top-down from safety criteria to safety functions, to design features, to functional design criteria, you'll end up with the requirements on a particular piece of equipment that is similar to where you would end up if you started at the bottom and said, as a design philosophy, I'm going to require X.

Let's say reactivity. I'm going to require two systems, and one system has to do this. Well, if I start from the bottom-up, I'm going to end

up in a similar place on those fundamental safety functions as I do when I start at the top and go down and say, what is my safety criteria offsite dose? What are my safety functions? I need to shut down the reactor. What am I going to use to shut down the reactor? In the light water reactor mode, it is going to be control rods. And then now, how do the control rods need to perform?

So, that's the argument we presented early on, and we used this Chevron figure back then. The safety criteria are just defined in this other box. We talked about that earlier in terms of Subpart B for DBAs, design basis accidents, and for licensing basis events; other than DBAs, the need to defense-in-depth, and so forth. Again, going back to that 1.174 figure and addressing the various considerations in an integrated decisionmaking.

One of the things that's subtle within Framework A is there is, under 53.450(e) for the analysis portion -- and, in particular, the analysis of licensing basis events other than DBAs -- the need to define for every event or category of events an evaluation criteria. And so, that, under licensing modernization, would be, basically, the frequency consequence target figure.

And that's a good way to look and analyze individual event sequences, but, like in LMP and in Reg Guide 1.174, you also want to look at the cumulative insights related to plant risk. And so, that's, again, why the QHOs come into both areas, 1.174 and Framework A.

One of the things I bolded here in the text, just to be clear of the role of the QHOs, because I'm afraid, again, just as we've gone through public comments, maybe people were misunderstanding how we were trying to use them and incorporate them. The QHOs are not being used, in and of themselves, to define what is adequate protection. It's only one measure within all of those things that were shown on the previous figure that we were looking at; all of the requirements.

We still do not, under Framework A, define adequate protection. We are, basically, saying we've gone through an exercise to try to make sure that it provides a comparable level of safety when you look at it in total, just like 1.174 is saying, when you look at it in total, you can use this kind of methodology and ensure, even though you might be justifying a change from an existing requirement, you are maintaining adequate protection because you've gone

through this exercise and looked at things like defense-in-depth and cumulative risk from a PRA.

Dave?

CHAIR PETTI: Yes, this is a really good discussion. I really like the previous slide.

I guess the concern that I have is you've shown, or you think you've shown, that Framework A has a comparable level of safety. But how do you know it's not overregulation to get there?

And I think part of it must be. I mean, looking at it in an integrated way, I just worry that many of the comments you hear from stakeholders are cherry-picking different aspects of it. And I think if you cherry-pick, you can lead yourself to a different answer than, you know, if you look at it in an integrated way. Have you got a start of that?

MR. RECKLEY: Well, yes, I think we've tried to. Again, since neither system, neither Framework, existing or Framework A, is going to define it in numerical terms, it's going to be a subjective judgment on both that it's comparable; that we've convinced ourselves, and two, that we didn't go way in excess in Framework A.

And one of the ways that we can see that is really drawn out of the experience on the evolution

of the Licensing Modernization Project, its use in the pilots that were done, and the observations that those designers and staff involved in looking at those tabletops -- the reason they were using the LMP and thought it worthwhile was it was a way to take advantage of the risk insights and focus activities in the right spot, and not overdo it.

It does change the emphasis somewhat, as does many of these things we're talking about, from overdesign to what some might say is overanalysis, right? So, you have to gain your objective to simplify a design. Mostly under Framework A you do that through analysis.

And so, again, I guess I'll just leave it there. We've talked about it. We've thought about it. It's going to be a very hard thing to have. We're not going to be able to say precisely. We're only going to have to say that we think we've reached the right ground, and as it's exercised, if somebody comes in and says, well, this is overkill, then we can entertain it.

But it, basically, is defining a methodology. There's so little prescription in terms of what's actually required of the plant design, that it's kind of hard to say where we would have gone

overboard.

CHAIR PETTI: Yes. No, I think your comment on the tabletops is, I think, valuable. Because, in my opinion, the big thing that both the licensee and the NRC have to figure out is, how do you know you're focusing on the right stuff when you've got a brand-new technology? And you don't have any sort of basis. You need a structure. That's always been the strength of LMP.

And so, the fact that the tabletops across different technologies led you in the right places, I think at least is sort of a pragmatic, a first look. This looks reasonable. And I think that's a good argument against some of the "Oh, this is overregulation." It's just it's different, you know, than what's there today.

No. Thanks.

I see Vesna has her hand up.

MR. RECKLEY: Uh-HUM.

CHAIR PETTI: Go ahead, Vesna.

MEMBER DIMITRIJEVIC: My comments will be a little on different aspects of it. I don't even know what to -- well, I want to start with the graph from Reg Guide 1.174. I like how you put this story, but this graph illustrates how deterministic and

probabilistic things fit together. And from that point of view, it is equally, or maybe even more applicable, for the Part B.

Because the principles which are, you know, the existing stuff, the defense-in-depth, design requirements, performance monitoring, this all applies even if you are not calculating your risk. So, from that point of view, this is what is actually used today. This was the main task in 1.174 to use today. Why isn't something risk-informed? Why is it risk-based?

But, I mean, I like how you integrate it here. I just want to point out that this was done to show how this information is coming from both sides, come together, and not only on the path where we are calculating risk change at the events which are related to PRA.

So, this is just my opinion and my first comment is not a question.

MR. RECKLEY: No, I know. No, I appreciate it, and that's what I tried to capture in that. We do have to be careful. 1.174 was developed to evaluate changes from where we were or where we are, and we are kind of extending that to the development of a whole new Framework. So, point

taken.

MEMBER DIMITRIJEVIC: Okay. And then, an important part of that point is it's equally, if not even more, applicable to Framework B. That's my opinion.

Okay. My other point is related to something you know that is my -- because I wrote a separate opinion. It is important for me. And this is the application of (audio interference).

So, I wanted to point to something in your preamble. I'm not really good in pronouncing that. But there, when you say that those are well-established cumulative risk measures used in risk-informed decisionmaking, and blah, blah, blah, in that sense, I challenge this. I don't think that's true. I think it's actually far from the truth because QHOs are not cumulative. When you say, "cumulative risk measure," what do you actually have in mind, Bill? I mean, cumulative in the sense it's cumulative, even sequences?

MR. RECKLEY: Yes. It's the integration of the individual event sequences.

MEMBER DIMITRIJEVIC: So, every core damage frequency is a cumulative measure, right?

MR. RECKLEY: Yes.

MEMBER DIMITRIJEVIC: So, it's a Large Release Frequency? So, what I want to say what is true, instead of what you are stating, the surrogate for QHOs have been well-established risk measures. Because when you say, "cumulative risk measures," actually, you can say CDF and LERF because that's cumulative risk measures which are well-established in risk measures using all applications so far. Is that a true statement?

MR. RECKLEY: I would say the CDF and Large Release Frequency or Large Early Release Frequency have been used much more than have the QHOs in terms of latent cancer and prompt fatality. Because --

MEMBER DIMITRIJEVIC: But is there much more that's implied that you endorse their use in the risk implications?

MR. RECKLEY: Where CDF and LERF were not an appropriate measure -- for example, in some of the Fukushima work, they were not deemed to be an appropriate measure; the work on spent fuel pools is a good example that's not going to use CDF or LERF -- we used the QHOs.

Likewise, when we were evaluating engineered filtered vents on BWRs, that was based on

latent cancer and prompt fatality, the numerical QHOs, not on the surrogates. So --

MEMBER DIMITRIJEVIC: Okay. So, let me just go back and I will try to explain why I have an issue with this.

So, for example, if you are going to use the latent cancer measure of less than 2 to the minus 6 per year, right? And there is not any importance measures, risk-importance measures, risk-significance, anything based on that, or any plants reporting what is the cancer fatalities. That is sort of a measure which is denied on something which connects core damage frequency, weak cancer which is based on all studies, and you had the million assumptions under this.

So, for example, does anybody say that this only applies if there is no cleaning of the soil? Or does this only apply if people come back and live there for 50 years? Or does anybody -- I mean, there is so many assumptions and uncertainties. And did you look in the results, latest results for Level 3 which show that this connection is like triple order of magnitudes of -- you know, this connection which said the cancer fatalities are connected, given core damage frequencies are 40 minus 3? Did you guys look in the

results for the latest Level 3 PRA?

MR. RECKLEY: Yes. So, I guess I would acknowledge what you're saying, that it's a more complicated calculation as soon as you need to go offsite and start to calculate the dispersion and the dose to individuals, and then, the health effects of those doses on individuals. Yes, we'll acknowledge that that's a more complicated calculation than is CDF, and by its nature, then, it's also increasing or introducing additional uncertainties.

But that is kind of built into the methodology that they'll need to address those uncertainties.

MEMBER DIMITRIJEVIC: But that's not built of you give them 2 to the minus 6 as the number. Then, you ought to be giving them the number which is based on all of these uncertainties and it's not true.

MR. RECKLEY: Well, but the comparison to 2 minus 6 might have the uncertainties you're mentioning. The 2 times 10 to the minus 6 itself is just the quantitative goal of .1 percent times the current estimates of the cancer occurrence. And that's how you get 2 times minus 6 --

MEMBER DIMITRIJEVIC: Yes, I have to say (audio interference), but as far as what I said in

this discussion, if your plans come -- like, for example, if NuScale comes under this part, they could have a core damage frequency of 10 to the minus 2 because their correction to core damage frequency in terms of that is not established. So, that's a point I'm trying to make. I'm trying to make, if you stay on a higher level, you can avoid all of those questions and just say nothing to this higher risk to the public.

My other concern in this is also, let's say that we have a NuScale that comes now and says that they meet this 10 to the minus 4 CDF, but, then, in order to do the QHO, right, they have to -- you know, you say also the right measures. So, let's say that we have established that you already accept the CDF and LERF are surrogate measures, right?

MR. RECKLEY: Yes.

MEMBER DIMITRIJEVIC: Right. So, therefore, if they satisfy the 10 to the minus 4 for CDF, that will imply they satisfy cancer deaths, right?

MR. RECKLEY: For light water reactors, yes.

MEMBER DIMITRIJEVIC: So, for example, does that mean that, then, light water reactors don't

need to do the Level 3 to show those deaths or not? If they have a CDF and LERF, are they good to go?

MR. RECKLEY: Basically, yes, as long as they can provide a reasonable argument. And for light water reactors, it's a well-established history that those surrogates are a conservative way of showing you meet the QHOs. So, yes, they could come in and say that they meet the light water reactor surrogates and the surrogates are applicable to them. And so, we --

MEMBER DIMITRIJEVIC: So, they don't need to do the Level 3 --

MR. RECKLEY: The Level 3, right. And likewise, any non-light water reactor, by the way, could do the same. For example, the simplest way to show you meet the QHO is to show you don't release radioactive materials.

MEMBER DIMITRIJEVIC: Right.

MR. RECKLEY: You don't need to do a Level 3 PRA or you don't need to do the dispersion models if there was nothing dispersed.

So, if any design were to come in and say, "We're don't need to calculate the QHOs," based on a code like MACCS, "because we don't have any release," as long as they can convince us that they don't have a release, then they're finished. You meet the QHOs

if you don't have a release.

MEMBER DIMITRIJEVIC: Well, right, but, in that case, you also need that you are not presenting -- you know, if you go back to qualitative goals, you are also meeting this. Why do you need to do these qualitative things, which are very questionable and based on these uncertainties?

What you're saying, they also, you know, meet the goal that you are not presenting -- you are not adding to any risk of an average person in the vicinity of the plant if you don't have the reactivity release. You are introducing something which is based on a lot of -- basically, cancer fatalities are calculated based on the position of the land, the people coming back, living there 50 years, being exposed to that. See, I mean, this is so -- this is so much of the things introduced. There would be no need if you just stay on the qualitative risk goals; you don't have to deal with any of those assumptions.

So, I don't see what benefit you were adding, especially because I claim it is not true that they are well-established. They have been called in certain circumstances, but they're not well-established. 1.174 is not based on them. PRA standards are not based on that.

I have never reported it -- and I have been doing PRA for 20 years -- I have never reported cancer fatalities in my life. I never said that the importance of the SSCs are based on increase of cancer fatalities. That's totally foreign to me.

Okay. This is just my comment.

MR. RECKLEY: Okay.

MEMBER DIMITRIJEVIC: And I will stop here. I have already expressed my opinion.

MR. RECKLEY: Okay. And, you know, the only point -- and we make it in the preamble as well -- is those that you mentioned, the particular ones for light water, are well-established and we acknowledge that.

The surrogate measures for other technologies are not there, and we would end up having to define the equivalent surrogate measures for each technology then.

The nice part, if you want to say it that way, about going back to the QHOs themselves, is they are technology-inclusive.

MEMBER DIMITRIJEVIC: Well, so is quality risks and such, you know; they are all technology-inclusive. And one of the things is that, you know, you can avoid -- you're talking about safety-

significant components, right? If you don't have surrogate measures and somebody is coming with a totally different design, then how are we going to establish safety importance of the components? That has to be discussed also at the beginning.

MR. RECKLEY: Right.

MEMBER DIMITRIJEVIC: Is safety importance of the components going to be established based on their cancer risk or purely fatalities? I mean, you know, this is -- what I was saying, we should leave the door wide open than trying to push this very much, in my opinion, at the official health objectives into this.

So, okay, this is how I feel.

MR. RECKLEY: Okay.

MEMBER DIMITRIJEVIC: Yes, I think everybody knows this by now. So --

MR. RECKLEY: Okay. So, we have one last slide, and then, Boyce, I think, can finish up the Framework B Safety Analysis stuff before lunch. I know we're running a little late.

But, Billy, if you go to the next slide.

This just basically goes through the comments we've received, some of which we just discussed.

So, the general feedback, both from ACRS and other stakeholders, has been not to include a cumulative risk measure, to include a different cumulative risk measure, as we were just discussing, in particular, surrogates for the QHOs, and then, to develop new safety goals.

So, this is also reflected in the response to the most recent letter from the Committee.

So, we continue to think it's important to have a cumulative risk measure, and I'll point back to the Reg Guide 1.174 kind of integrated decisionmaking process to explain why we think that.

MEMBER DIMITRIJEVIC: Okay. I come again -- sorry -- but I do here, because I brought this discussion. What is it that you mean by cumulative risk measure? You mean, actually, the integrated sequences?

MR. RECKLEY: Yes.

MEMBER DIMITRIJEVIC: But they have always been used? What is the other option than cumulative risk measure?

MR. RECKLEY: Some stakeholders have said we should not have a cumulative risk measure.

MEMBER DIMITRIJEVIC: So, what is the alternative to not cumulative? Just analyze one

sequence?

MR. RECKLEY: One would be, for example, that the current way we do it in Part 52 is there is no requirements in the rule to meet the safety goal, but we do it through guidance. We do it in Chapter 19.

MEMBER DIMITRIJEVIC: But nothing different than saying, cumulative? What you are saying, that's two different stuff, right?

MR. RECKLEY: No.

MEMBER DIMITRIJEVIC: I mean, you know, what is opposite of "cumulative"?

MR. RECKLEY: Well, Billy, if you can go back up one slide perhaps?

For example, if you were looking at the frequency consequence curve in the yellow, and you look at every event sequence, if you can convince yourself that every event sequence is to the left of the frequency consequence curve, but, in addition to that, you want to look, we think you want to look at what is the cumulative risk.

MR. BLEY: I'd like to jump in, Bill, if I might?

MR. RECKLEY: Yes, please, Dennis.

MR. BLEY: When you go to the LMP

approach, like Bill is pointing out here, using this FC curve is done on a sequence-by-sequence basis, and then, when you're all done, you're still left with the question, well, how many sequences are there? What's the total risk from this thing? And is it too high for the whole plant?

And several things have been proposed in the past. 1860 has two of them. One is that there be developed a CCDF curve that's a limit curve, and you shouldn't exceed it anywhere with your total result from your PRA.

The other one that was set up there, and has continued in what they're saying here, is that the QHOs are -- because they are a result of the sum of everything in the risk, they give you a place to see if the overall risk is too high or too low.

I always like the first of those, but nobody has pursued that very much. But that's what they're talking about, is, how do you make sure you don't have too many of these sequences that are okay, but all together the design is not okay?

MR. RECKLEY: Yes, thank you, Dennis.

So, Billy, if we can go back.

The two last bullets then. We talked about the use of an alternative like surrogates. We

say it's allowed, but keep as the measure what we think is the technology-inclusive measure, which is actually the QHOs.

And then, the last thing was some had proposed that we develop new safety goals, either to address concerns beyond public health or in some stakeholders' views, because the safety goals should be revisited. They were developed in the 1980s, for example.

And our response -- and this is reflected in the letter -- is that we stuck to the rulemaking plan that, where we're going to use established measures; that we really didn't have the time or capacity in this Part 53 effort to do something like revisit foundational things, like the safety goals or linear no threshold, or some other things that people thought maybe we should consider, as we did Part 53.

So, we stuck with Commission findings like that in the Staff Requirements Memorandum for SECY-10-0121, and to some degree later on, after Fukushima, SECY-12-0110, where the question of, should we come up with new safety goals was posed, and the Commission came back and said the existing safety goals are fine and should continue to be used.

So, that's where we are. We're not,

basically, taking a position on the merits of doing new safety goals or not. We're just saying that we weren't able, as part of this effort, to undertake something like that.

So, with that, Dave, I think Boyce can probably be done by 12:30. Do you want to --

CHAIR PETTI: Yes, let's do that, and then, we'll go to lunch.

MR. RECKLEY: Okay. Boyce?

MR. TRAVIS: Thanks, Bill.

So, this is Boyce Travis from the staff.

I'll be moving on to the Framework B, Safety Analysis and Technical Requirements, as opposed to the ones we've been discussing for Framework A over the past hour or so.

So, moving on to the next slide.

So, the Framework A, Safety Analysis and Technical Requirements, are largely located in Subpart R, which is the licensing certifications and approval section. And this is very similar to how the requirements are reflected in the existing Parts 50 and 52 Framework.

And so, this slide focuses on 53.4730(a)(1), which is Site Safety Analysis. The safety analysis requirements are derived from those in

52.79 and the corresponding Part 50 requirements. The first few requirements there are largely identical to Part 52 requirements. I'm not going to spend a lot of time on those. We've discussed them at a previous ACRS meeting.

We have made some changes in (a)(1) to ensure that the rule was appropriately technology-inclusive, and we've also made some, what I'll call, clarifying changes that don't change the technical meaning of what's there, but did find the opportunity to provide some additional clarity.

In addition, the preamble provides some background and context discussion that we think helps provide the appropriate level of detail for why we've chosen the requirements that we've chosen here.

The third bullet contains the exact text that we provided for making the rule technology-inclusive with regards to Site Safety Analysis. And we've afforded some additional flexibilities regarding the fission product releases that could be calculated. But I'll note that, consistent with what's done in Parts 50 and 52, the Site Safety Analysis is based on a major accident, and what that major accident looks like might be different for different technology types.

You know, we're not going to prescribe the specific release, as has been done historically for LWRs because that would be generally overly constraining, we think, for the broad variety of technology types being considered that we know about and the ones we don't necessarily know about on the near-term horizon.

In addition, there's a requirement or an optional requirement in this section that would allow an applicant to comply with more restrictive dose criteria, effectively, inherit these dose criteria as their new Site Safety Analysis requirement if they were looking to, for instance, use the Draft EPZ Rule or other requirements that would impose a more restrictive dose requirement rather than the 25 rem, which is there in this requirement, consistent with the Part 50 and 52 requirements today.

And so, that largely covers the Safety Analysis, as I know not a lot of changes were made since you all last saw this rule or this text.

CHAIR PETTI: Boyce?

MR. TRAVIS: Yes, go ahead.

CHAIR PETTI: I understand what you mean by the italicized bullet, but, for like a molten salt-fueled reactor, fuel and core damage, they may argue

that they don't ever sort of get that. So, it might have to be covered in some relevant guidance to expand -- you know, you're looking for anything. There's a potential for large radiological releases from any source.

MR. TRAVIS: Yes, I do agree with that.

CHAIR PETTI: Yes.

MR. TRAVIS: So, I think this is relatively clear in the preamble discussion, but, I mean, as you know, molten fuel designs are technologically unique. And I would consider the release of molten fuel from the reactor coolant system to be fuel damage. I understand those designers might not. And so, in that case, it is a non-traditional technical, not argument, but discussion to be had. We think the rule captures that, but we are very receptive to feedback, if we can make this more clear.

CHAIR PETTI: I always thought it was like core upset, something like that, that might be broader, but, you know, it's just something to think about.

MR. TRAVIS: No, that's good feedback and we will take it to consider. I'm sure that there are numerable ways that this could be approached and I would not please everyone with whatever language got

chosen.

CHAIR PETTI: Yes.

MR. TRAVIS: And so, moving on to the next slide, the next large set of technical and safety analysis requirements is in 53.4730(a)(5), which breaks out the initiating events and accident analyses requirements. They're all located in one place and they are more explicitly divided by event classification than they are in the Parts 50 and 52 requirements.

However, the genesis behind all of the requirements, but the last one that we'll discuss here in a second, is derived from the philosophy and the regulatory requirements in Parts 50 and 52. All of what's here leverages the language that was previously developed as part of Part 5X that we came before ACRS with a little over a year ago, maybe a little closer to a year and a half ago. And the preliminary proposed rule maintains top-level requirements that are consistent with acceptance criteria consistent with those in 50 and 52.

So, moving on to the next slide, I'll break these out by what's in each category of both 4730(a)(5). There's a top-level, you know, little Roman numeral (i) for analysis and evaluation that

kind of describes the high-level analysis and evaluation requirements that's derived from 52.79(a). We've made changes there to accommodate multi-unit language that was perhaps a little muddled or not explicitly clear in the previous revision of the rule text.

In Roman numeral (ii), Design Basis Accidents, we've made some contextual changes, just to provide additional clarity and clean some things up. And this really includes -- this is the traditional requirements for deterministic analyses from Parts 50 and 52; i.e., your design basis analyses are defended against using only safety-related equipment.

Roman numeral (iii), there has been a change made since we last came before ACRS, additional context for normal operation and anticipated operational occurrences. This is consistent with the existing requirements and includes the Part 20 acceptance criteria, and it adds normal operation. And some of this discussion is provided in the preamble. But there are no analytical requirements for normal operation, but the Part 20 acceptance criteria still do apply for normal operation. The expectation is, you know, and always has been, that you would remain below those as an applicant.

Continuing on to the next slide for (a)(5), little Roman numeral (iv) has been renamed to Additional Licensing Basis Events. These are -- and we've provided some additional clarity and text changes in the requirement itself -- just to kind of better hone in on what the scope of initiators and event sequences that need to be considered to be defended against using SSCs and those that need to be looked at analytically as part of the plant design as a whole, consistent with what's done in Parts 50 and 52 today under the RTNSS classification system.

And so, the requirement breaks out that there are events like ATWS and SBO that are not design-basis in the traditional sense, in that they require either multiple failures or are outside the scope of what's looked at in that traditional deterministic analysis, but our operating experience has shown that these events do need to be evaluated, and the Commission has decided that there is a need to provide appropriate measures to defend against these events.

We don't want to prescribe rule text as what's in the ATWS and SBO rules now because those are very technology-specific to LWRs, and we acknowledge that there are ways for non-light water reactors to

design these out without having to provide additional equipment in some cases. And that would be a viable path forward to satisfy this requirement.

Finally -- or not finally, I guess; there's two more -- severe accidents is Roman numeral v. This is derived from what's in 52.79(a)(38). We've made modifications here to support technology-inclusiveness because the (a)(38) requirement specifically refers to LWR severe accident mechanisms that would not be sufficiently technology-inclusive.

And then, originally, in Roman numeral v, I had defined a severe nuclear accident. That's been moved up to the definition section to kind of bring everything into one place. And that will be talked about later, further this afternoon, by I believe Marty.

Finally, there's a chemical hazard requirement, Roman numeral vi. This is consistent with what's been put in Framework A and it's to address substances that are commingled with licensed or radiological hazard-producing material.

Moving on to the next slide --

CHAIR PETTI: So, Boyce, just to --

MR. TRAVIS: Yes?

CHAIR PETTI: I wanted to come back. Joy

had asked this earlier question. There's a design basis, and here are additional requirements formerly outside the design basis. And so, there's been some comment from stakeholders about, you're including license events outside the design basis now in the overall licensing of a plant. But, in fact, they've kind of been there all along. You're just pulling them all together here. Is that --

MR. TRAVIS: Yes, that is correct. And I would go further to say, we tried to hone this requirement as much as we could because there's a fine line to tread here in making it technology-inclusive, trying to address the appropriate scope of events. And as you know, there are a series of requirements for, I'm going to call them, regulated beyond design basis events for the purposes of this discussion, like ATWS and SBO, that have been added to the scope of the licensing basis, but are not -- and design basis is a loaded term in the sense that it's not captured in the structure. It's stylized design basis analysis, but it is part of what is required for the plant to defend against.

And so, the goal with this requirement was to provide something akin to that that didn't prescribe specifically here's what you have to do for

ATWS; here's what you have to do for SBO, because we wanted a more integrated look at what the hazards were for the plant from the perspective of, and using this as an example -- and this is in the preamble -- to say, effectively, if there are things on the frequency level of the design basis accidents, and they just aren't captured there because of the stylized nature of the analysis, you know, they need to be evaluated and dispositioned somehow, whether that's via design features that aren't safety-related or programmatic controls or various other mechanisms that are available to the designers.

And so, we think this provides flexibility, but, as you know, this is not a departure, as it were, from the existing regulatory structure. It's just a different way to write it down.

CHAIR PETTI: All right. Well, thanks. That's good to have out there. Thank you.

MEMBER REMPE: So, again, I agree, but to avoid any misconceptions by others who may not fully understand it, for whatever reason, I think it's important to emphasize that in the preamble, as Dave suggested earlier, wherever you can, just to make sure folks understand this. Because, again, I think it's

great that you've kind of tried to put things in the frequency regime because that's not done in the other Frameworks.

But, anyway it's just something to think about. And I know you can't do that with Framework B because the frequencies aren't there, but I just would make sure that everybody understands this, so there aren't comments about that we're regulating down to a more restrictive; you know, we've changed the bar and we're making things more restrictive.

MR. TRAVIS: Yes, thanks, Dr. Rempe.

I'll note that the staff paid particular attention to developing the preamble for this section because we knew this was an area that the rule language probably could not be sufficiently specific, and the preamble was the best place to provide that additional context. And so, we do appreciate that comment.

MEMBER BROWN: Boyce?

MR. TRAVIS: Yes?

MEMBER BROWN: Charlie Brown.

When I go back -- I'm trying to figure out where we are. Slide 30 was Framework A, Consideration of Feedback, Including QHOs. The previous slide was Framework A, et cetera. Now, I'm in Subpart R; it's

Framework B.

MR. TRAVIS: That is correct, yes.

MEMBER BROWN: Okay. You've flipped to Framework B now in your discussion, but yet, the Framework B shows up -- I had to go find what you were talking. So, I pulled up this other text. Then, we get back into Framework B around slide 37.

Is there a reason? You didn't announce that. Did I miss this or something?

MR. TRAVIS: No, I apologize. I could have been more clear. And certainly, there was a -- I think we were trying to appropriately tie the safety to -- or to draw an appropriate distinction between the Safety Analysis requirements in Frameworks A and B.

Because once we got into Subpart R, Framework B, on slide 24, I believe, the two Frameworks do have different ways to approach safety analyses. And so, we knew that QHOs were going to be a point of discussion. And so, we went into that starting on slide 25, but, in reality, from a consistency -- or sorry -- from a Framework B flow perspective, yes, slide 30, or excuse me, slide 31 kind of follows slide 24 in the sense that slide 31 is talking about -- starting with slide 31 is again

talking about Framework B specifically; whereas, slides 25 through 30 were talking about how the QHOs in Framework A, Safety Analysis, were developed.

MEMBER BROWN: Okay. I was trying to connect this with QHOs and everything else, and I lost the bubbles. Okay. Thank you.

MR. TRAVIS: No, I apologize. In Framework B, QHOs are handled the same way they are handled in Parts 50 and 52 today.

MEMBER BROWN: All right. Thank you.

MR. TRAVIS: No problem.

So, moving on to the next slide, which maybe is 35, slide 35. Thank you.

This is 53.5730(a)(36), which is the containment requirements. This is the other, I would say, large area of technical consideration in Framework B that is very different from Parts 50 and 52 and different from what's in Framework A.

The containment requirements are split to acknowledgment differences between non-LWRs and LWRs. For LWRs, the same approach as applies under 50 and 52 currently is put in the regulatory requirements for containment in Framework B. That is, that you need leak-tight primary containment that meets Part 50, Appendix J, and you need to address any technically-

relevant requirements related to LWR operating experience. And that's consistent with the Commission's policy that was expressed in the SECY paper on functional containment.

For non-LWRs, we afford designers an additional level of flexibility to say they need a set of barriers -- plural -- that are used to meet requirements for AOOs, DBAs, and siting criteria. And this set of barriers comprises their functional containment. That definition, which was kind of implicit in the text of what was previously in (a)(36), has now been moved up to 53.020(a).

And then, the safety classification of those SSCs that are credited to defend against radiological releases that make up the functional containment barriers need to be classified as safety-related. That's explicitly required here.

There are no other requirements per se. So, there's no, for instance, direct requirement on a leakage test, as there is in Appendix J. But, using as an example, if a designer was crediting the performance of a building to have a certain leakage level, that would be inherited as a design requirement, and the NRC would expect there to be maybe a technical specification, or something like

that, to justify that leakage level that's being credited as a functional containment barrier.

And so, that kind of covers the discrepancies in deltas between both Framework A and the language that we showed you previously on Framework B for safety analysis requirements and what currently exists in the proposed rule.

And if we move on to the next slide --

CHAIR PETTI: Boyce, before you go there --

MR. TRAVIS: Yes, let's go back.

CHAIR PETTI: -- I'm not sure we're going to talk about tech specs and LCOs, and the like, but in the preamble you guys were interested in expanding the definition of LCOs. And the little bit that was there, I just worried that it may not be implementable in some aspects of functional containment. And I was trying to understand. Maybe I've misunderstood what the additional wording meant. We're not going to cover that later, right?

MR. TRAVIS: No, it's not planned as a topic. I can kind of try to speak to that. I mean, so we are asking a question in the FRN on --

CHAIR PETTI: Right, right.

MR. TRAVIS: -- on the change.

So, the short answer is we made a change to what's there because the old requirement says something to the effect of -- and I'm paraphrasing a little bit -- primary success path, and it wasn't exactly clear to us how. So, in the previous requirements there's an expectation for a containment, and that containment is going to have technical specifications; it does have technical specifications associated with it. In the new Part 50, or the new requirements, we weren't sure there was a way to catch that. And so, we modified the language slightly.

But we are asking the question because we're not sure what we did was necessarily the best way to go about that. And so, I appreciate the feedback, and I think we're still in the learning process. We just wanted to make sure that functional containment as a concept, and how those barriers were reflected, specifically, that they are going to perform as they are assumed to in the Safety Analysis, is reflected somehow operationally. And so, we added the language we chose.

But I think I understand your comment. And does that address it at this --

CHAIR PETTI: I'll stick it in the letter. Hopefully, it will survive discussion with the

Committee. But I was worried about like, of course, in TRISO fuel the barriers are so deep in, you know, they're part of the fuel particles; there's more than one barrier in there. How you measure stuff, that's what I'm worried about. I'm not worried about an external barrier that is an engineering barrier at a scale that one can do traditional engineering stuff.

MR. TRAVIS: Yes.

CHAIR PETTI: That was just the concern I had, was how the language could be interpreted.

CHAIR PETTI: Sure. So, I totally understand where you're coming from, Dr. Petti.

So, this is me personally talking. How I would be addressing, how I expect that to be addressed by a designer is a damaged -- basically, when you have damage, you no longer meet the LCO. So, for instance, a circulating activity requirement tells you that you have failed TRISO barriers; therefore, you are no longer -- your functional containment is no longer intact, if that makes sense.

CHAIR PETTI: Okay.

MR. TRAVIS: So, not measuring the TRISO directly, but saying I have a coolant activity requirement that needs to relate -- for me to operate, I need to remain below a certain level. And that is

indicative that I still have a functional containment barrier intact with the TRISO.

CHAIR PETTI: Right. Okay. Yes, I understand. Okay.

MR. TRAVIS: Yes. That's all I have on safety analysis.

The next slide contains a high-level discussion of areas. If there are any questions on general technical requirements, I'll let Bill Jessup address those. And this just kind of goes over areas where we made some changes to technical requirements in 4730.

MR. JESSUP: Yes, thanks, Boyce.

And I understand I'm in the way of lunch. So, I will be efficient, but please stop me if there are questions.

Again, for context, we are still talking about Framework B. Boyce hit on kind of the safety analysis requirements. I wanted to wrap up to talk about just some of the deltas in the other general technical requirements that have been implemented or proposed in the most recent iteration.

If you look at paragraph (a)(2) for facility description, we had a requirement here related to codes and standards that would be used in

the design of SSCs. And we did that because we looked back at the existing requirements for light water reactors under 50.55(a) and recognized that, while we maintained the 50.55(a) -- excuse me -- 10 CFR 50.55(a) codes and standards requirements for light water reactors, we didn't have a similar requirement that would explicitly cover other technologies. So, did a paragraph to that effect under (a)(2).

Under (a)(4), this ties back to what Jordan had mentioned earlier about the definition of safety function. We appreciated the recommendation from ACRS about adding clarity around that concept. And so, in (a)(4), we did add a sentence that would make that implicit relationship between the PDC and safety functions a bit more explicit, because we agreed there would be value in doing that.

Under paragraph (a)(11), dose (audio interference) to the public, the changes really here are focused on aligning these requirements more closely with those that are currently in 10 CFR 50.34a -- it's just 50.34a, not parenthetical (a) -- not including the references to Part 50, Appendix I, where we made some slight changes in comparison to Appendix I, Part 50, Appendix I.

Paragraph (a)(14), Earthquake Engineering

Criteria, again, linking back to the discussion that we had earlier this morning, the addition here is reflective of that alternative set of seismic designs performance criteria that we talked about. So, this paragraph preserves the baseline, Part 50, Appendix S, seismic design requirements, but there is a new sentence that reflects that applicants could pursue the alternatives under 53.4733 that we discussed this morning.

Paragraph (a)(34), the description of risk evaluation, this is where PRA and AERI are discussed, and there's going to be a full afternoon session on AERI. So, I just flagged it here because there were changes to the AERI approach, but those will be discussed at length this afternoon.

Paragraph (a)(37) contains the requirements specific to water-cooled reactor designs that would come under Framework B. Several references in this paragraph back to Part 50. Just two notable changes.

We deleted a requirement that was related to containment leakage testing because we felt it was redundant to requirements that are already in Subpart P, and also, what Boyce mentioned in 4730(a)(36) on the prior slide.

And the last item was that we removed the requirement for evaluating conformance of a design against the standard of U-PLAN (phonetic). Deletion of that requirement actually aligns us with some of the ongoing policy work in the 50-52 harmonization rulemaking that recognizes that new guidance beyond the SRP is going to be available for new reactors; and also, that new designs are likely to be sufficiently different from the large light water reactors that inform the current SRP. So, maintaining and performing that conformance evaluation would likely have limited benefit for the staff and prospective applicants as well.

And the last note is just kind of a catchall, the other changes to 53.4730, largely organizational and administrative, since the last iteration.

So, again, I'm in the way of lunch, which is a dangerous place to be. But if there are any questions, I'm glad to take them.

CHAIR PETTI: Okay. I'm not hearing any questions.

Let me just ask some questions. I'm trying to decide, do we need the full hour for lunch? And I think that, in part, depends on how long we

think the discussions this afternoon will take and whether members want to push beyond that. Do we want to take 30 minutes out of lunch here to assure ourselves we'll get done by 5:30 Eastern? Or do we just want to keep with the hour and hope we're more efficient this afternoon than we were this morning?

Members, anybody have --

MEMBER HALNON: Dave, this is Greg. I only need 30 minutes for lunch. But my restaurant is right next door.

CHAIR PETTI: Yes. Okay. Well, let's do a 30-minute lunch then, and let's come back at 5 minutes after the hour, and then, hopefully, it won't drag us too late in the afternoon today.

Thanks, everyone. That was a monstrous amount of material to get through this morning.

And thanks, Bill and Bill and Boyce. It was good.

(Whereupon, the above-entitled matter went off the record at 12:36 p.m. and resumed at 1:05 p.m.)

CHAIR PETTI: Okay. Hopefully everyone is back from lunch. It's five after the hour. And let's start talking about AERI.

MS. WAGNER: Good afternoon. Welcome to this presentation on Part 53, Framework B, alternative

evaluation for risk insights and Draft Guide DG-1413 and DG-1313. Next slide, please. My name is Katie Wagner, and I'm a project manager in the Division of Advanced Reactors and nonpower production and utilization facilities in the Office of Nuclear Reactor Regulation. Next slide, please.

So as part of our agenda today, we have a number of presentations. First, we'll go through introductions and recent activities which I will cover. And then Marty Stutzke will cover the proposed AERI entry conditions including the draft proposed real text and FRN sections.

Then Keith Compton will present on the evaluation of dose based AERI entry criteria using the MELCOR accident consequence code system which we call MACCS. And then the respective authors will present on DG-1413, technology inclusive identification of licensing events for commercial nuclear plants and DG-1414, alternative evaluation for risk insights or area methodology. Next slide, please. So to briefly introduce -- oh, previous slide, please.

Okay. So to briefly introduce my colleagues, Marty Stutzke is the technical lead for the Graded PRA Working Group. He is also the senior level advisor for probabilistic risk assessment and

the division of advanced reactors and non-power production and utilization facilities in the Office of Nuclear Reactor Regulation or NRR. And Keith Compton is the lead for the MACCS calculations related to the AERI entry conditions.

And he is a senior reactor scientist in the Division of Systems Analysis in the Office of Nuclear Regulatory Research. We also have with us today Mihaela Biro who is the principle author of DG-1413, technology inclusive identification of licensing events for commercial nuclear plants. And she is a senior reliability and risk analyst in the Division of Risk Assessment and NRR.

And our other presenter is Anne-Marie Grady And she is the principle co-author of DG-1414, alternative evaluation for risk insights or area methodology. And she is a reliability and risk analyst also in the division of risk assessment, NRR. And I already introduced myself. Next slide, please.

So moving on, this side shows the membership of the Graded PRA Working Group. And as you can see, the working group is composed of over seven technical staff from several divisions of NRR and also receives support from the Office of Research and Dr. Robert Budnitz who is a consultant. And the

membership of the working group is diverse. And so that ensures that the technical questions receive feedback from a variety of points of view. Next slide, please.

So to briefly recap recent activities in early summer 2022, the AERI team briefed the ACRS subcommittee. And then a few weeks later on July 6th, we had another briefing with the full committee meeting at ACRS. And then the ACRS issued a letter dated August 2nd, 2022 regarding AERI.

And the path forward discussion in late June covered just a few -- or covered a few items including for both draft guides making revision and response to stakeholder feedback including the ACRS and monitoring changes to the preliminary proposed rule text. And for DG-1414 in particular, our group had planned to develop guidance, area maintenance, and upgrades. And now my colleague, Marty Stutzke, will discuss the AERI-related draft proposed rule text and FRN sections.

MR. STUTZKE: Good afternoon, everybody. Next slide, please. So as Katie introduced me, I'm Marty Stutzke, the senior technical advisor for PRA in NRR DANU. Next slide, please. This diagram provides kind of the big picture behind AERI emphasizing some

of the regulatory basis.

And I wanted to reiterate it to help orient everybody as to how AERI has been constructed. So on the left-hand side of the diagram, you will see some policy statement quotations there. I apologize for the small font size in some cases. But we start out with the policy statement on the regulation of advanced reactors.

And in that policy statement, we find the Commission expects that advanced reactor designs will comply with the safety policy statement. So you can see the little arrow going off to develop this demonstrably conservative risk estimate in order to achieve that expectation. Further down in the policy statement, it also notes the Commission has issued policy statements on the use of PRA and severe accidents. It goes on to say the use of PRA as a design tool as implied by the policy statement on the use of PRA.

This one is interesting because when you actually read the PRA policy statement, I'm talking now about the box in the lower left-hand corner, you find this very interesting quotation that says, it's important to note that not all of the Commission regulatory activities lend themselves to a risk

analysis approach that uses faltering methods. In general, faltering methods are best suited for power reactor events that typically involve complex systems, and I'll emphasize that, complex systems. The policy segment and we'll talk about the use of other sorts of techniques, for example, integrated safety assessments from material licensees, and concludes with a quote, Commission realizes that a single approach for incorporating risk analyses is not appropriate.

MR. BLEY: Marty?

MR. STUTZKE: Yes.

MR. BLEY: It's Dennis Bley. I like this quote you pulled up. It essentially says event tree/fault tree PRA isn't the only kind of risk analysis you can do. Given that the question that arose earlier seems in need of some further explaining and that is why AERI wouldn't be applicable to licenses under Part 50 or 522.

MR. STUTZKE: Yeah, I'll try to address that briefly here. I have to admit I hadn't thought about it a great deal until the question was asked earlier this morning. My personal view, Dennis, is it's kind of a coordination or a priority issue.

The Part 50, 52 rulemaking started way back in 2009 which clearly predates NEIMA by a decade

like that, and it received various emphasis. It took a long pause. And finally, in June of this year, they submitted the rulemaking package to the Commission. So it has not yet been issued for notice and comment like that. So --

MR. BLEY: I guess what I was getting at is some members of the Committee and they included me when I was a member and still look at PRA as kind of a continuum of more complex and less complex kinds of analysis of risk such that many different approaches can fit under that name. And we seem to have locked into PRA means event trees and fault trees and extremely complex modeling which has been very useful for the large reactors but may not be the best approach for lower power and simpler systems. So it's kind of definitional.

And this statement by the Commission seems to agree with that kind of definition. But go ahead. I won't interrupt anymore. I'll let you keep going.

MEMBER HALNON: Hey, Dennis. This is Greg. I think I sent you the email. But one of the things I thought of was that if we keep the same entry conditions for an area type analysis, then the whole part of 53 or the facility being as simple and less complex if you will would probably benefit from the

rest of the Part 53 rule.

So going under Part 50 or 52 with such a simple facility may or may not be the right call for a design. So I was just thinking through what you were talking about. I think stepping back, 53 and AERI are pretty complementary. 50 and AERI may not be as complementary.

MR. BLEY: Yeah, I think so. But as Dave pointed out for the next three or four years or maybe more, that wouldn't be an option if anybody wants to come in.

MEMBER HALNON: Yeah, I agree with that. That was a good point.

MR. STUTZKE: I would add to it. There are a variety of ways of doing PRA as Dennis noted. And specifically the non-LWR PRA standard provides a way to grade the technical content of PRAs according to where you are in the licensing process.

And that was originally how we had approached the problem was, can we grade the technical content by accepting lower capability categories or certain supporting requirements and that sort of thing? And we realized, well, it's already built in to the non-LWR PRA standard like that. The second thing and I agree with what Greg was saying is that

for a plant to come in under AERI, they're already going to meet all the other regulations.

In other words, they're going to have principle design criteria and a full set of design basis accident analyses, et cetera, et cetera. That being AERI is not a maximum hypothetical accident approach like we would use for research or test reactors. So in that sense, the purpose of AERI is like the purpose of PRA in that it is providing a confirmatory or a supporting role to ensure you haven't missed anything or I should say to help ensure that you haven't missed anything.

As far as about applying AERI over to Parts 50 or 52, I mean, I would just point out Part 52 is pretty clear. You have to have a PRA. So an applicant that wanted to go down that path would have to seek an exemption.

And as we'll discuss a little bit later in this presentation, while there is currently no requirement to have a PRA for Part 50 applicant, the Commission certainly expects that to be the case. And that's in fact one part of the rulemaking that's ongoing is to require a PRA. So I won't speculate beyond that.

Anyway, so let's flip to slide 45. And

the text in the upper portion, the italics text is a quote out of the preamble that's trying to explain AERI would apply to commercial and nuclear plants with relatively straightforward designs. Not overly complex system and notice the same language appears in the PRA policy statement.

So not overly complex systems and interactions and accordingly wouldn't warrant the development of PRA to provide the qualitative insights or quantitative insights like that. So the big challenge behind AERI is deciding when it would be permissible to allow a plant to use AERI and accordingly when they would be required to do a PRA. And it centers around this notion of complexity and interactions.

And quite frankly, it's been a real challenge to put that down into words about where's the boundary between them. So in the left-hand side of the diagram, you'll see the proposed rule text that we had presented to you all back in June. And then the right-hand box shows what we're currently proposing like this.

And you will notice that the entry condition in 53.47, 38.34(ii), it's split into two separate entry conditions, A and B as shown there.

And we have worked on the language to A, but it still retains the essence of dose at a distance. So they acknowledge it partially demonstrates the consequence, et cetera, et cetera.

We then added this qualification in B that says, you need to demonstrate that you meet A without reliance on active safety features or passive features except those that don't require equipment actuation or operator action, et cetera, et cetera, like this. So again, that's trying to get at this point of complexity versus simplicity. And I'll show you a little bit later that Qualification B also enables the use of generally licensed reactor operators elsewhere in Framework B. So let's go to slide 46, and I'll try to explain --

CHAIR PETTI: Hey, Marty. Just before you go there.

MR. STUTZKE: Yes.

CHAIR PETTI: The second capital B, I understand passive heat removal. I think I can envision systems that don't require the operators to do anything or any equipment to actuate. But shut down, I can also envision that not requiring an operator. But some equipment, a latch has to be moved. There's some equipment actuation most likely.

Does that mean that those guys can't get in?

MR. STUTZKE: I think you raise a good point that we might need to explain better in guidance about what sorts of systems. I certainly didn't mean to exclude the idea of a SCRAM system and dropping the rods in. But it gets very interesting when you think about the distinction between inherent and passive and active.

In my mind, clearly the gravity inserting the control rods is inherent based on physical things. But as you pointed out, you need other systems, passive or active, to decide when to shut down the reactor like that. So I find it very hard. I tend to think of it as they're passive components but not necessarily passive systems. They rather seem to be a blend.

MEMBER HALNON: Marty, this is Greg. I was going to wait till later. But this term passive, there's no definitely of it. There's no real good explanation of it.

So you're always qualifying it with different stuff. Is it time to -- when you're talking about this to define what you mean by passive, you mentioned the GLRO. And back in that section, you introduced a term called self reliant mitigation

facility which is not really defined. It's kind of sort of defined.

And now you're mixing that with the AERI. And you're kind of defining it a little bit different but kind of you can kind of make the case that it's the same. I think you might consider taking those two terms, self reliant mitigation facility and passive as it's used in that and consider a very succinct clear definitely so that there's no confusion when you're going back and forth between GLRO, AERI, passive, and that sort of thing.

So consider it. I get confused going back and forth when I was trying to read it. And you can kind of make a case that they're closed. But they're not quite the same.

MR. STUTZKE: Yeah. Dave Desaulniers, did you want to add something to the conversation? Or Maybe Jesse Seymour? You'll get a whole explanation on self reliant mitigation facilities tomorrow when we talk about the operator licensing.

MEMBER HALNON: Yeah, we can wait to talk a little bit in detail then. But I just wanted to lay that out there because Dave brought up the passive issue. Again, in our regulations and guidance, I never really find a good definition of passive. And

you mentioned inherent.

But in this thing, it talked about passive, but you can't have any active portions of that. Well, it should be part of the definition of passive. But there's nothing active.

MR. STUTZKE: Yeah, and we have looked at IAEA guidance trying to get some ore clarity. But I'll take that one back.

MEMBER HALNON: And we can talk more in detail about it tomorrow. But if you need some cross referencing, I can show you where got more confused in the license operator portion.

MR. STUTZKE: Certainly. Jesse, do you have a comment?

MR. SEYMOUR: Yes, Marty. I was just going to add on. This is Jesse Seymour from the operator licensing and human factors branch. And just that we do intend to talk a little bit more about the Framework B GLRO criteria and specifically the criteria that apply to non-AERI and AERI facilities within that context as well as what the underpinning bases are really for all the criteria.

So tomorrow, we'll get into that. The criteria look different depending on whether or not you're talking about Framework A, Framework B, or

AERI. But what are the underlying objectives and what are we trying to achieve there?

So yes, we'll dig into that. It is -- I will say it's something that we continue to think through and to discuss as we approach this problem. And Marty and I have spent a lot of time talking about what is the objective and what are we really trying to achieve and exclude here.

What I would say is that our focus with these words had really been to try to narrow things down to safety features that were of a robust passive nature, again, another undefined term. Or things that were inherent, again, to try to -- and Marty, please feel free to chime in if I mischaracterize that. But really what we're, I think, trying to do here is to say that in a relatively uncomplicated fashion that has a very, very low probability of failure that this facility would weather this event and still remain within it's radiological consequence criteria, right?

And so that conceptually is very simple. But again, the devil is in the details when you try to put that into words. And one of the areas we found to be something that's a complicating factor is when you start trying to get into a definition for inherent, a definition for passive, right, that these are areas

that -- again, there is a bit of a lack of good definition in some regards there. So Marty, that's really all I had to add.

MR. STUTZKE: Yeah, thanks, Jesse. Let's go to slide 46, please. As we had discussed back in June, the original consequence criteria and the AERI entry condition, the dose distance criteria, we're inspired by the EPA PAGs. And to be fair, the EPA PAGs are actually used to respond to actual events.

And in contrast, the AERI entry conditions are talking about postulated events used to establish the licensing basis. So there's been some concern that we're inappropriately leveraging the PAGs for a purpose that they weren't originally intended for. Moreover, the PAGs aren't limits.

From a quote out of here, it says the trigger points for taking protective actions, they're not just limits that cannot be exceeded. So we don't want to take them out of context. And last but not least, we don't want stakeholders to misconstrue that the proposed AERI entry conditions imply that it's acceptable to ghost the public.

So we've had extensive conversations between NRR DANU and NSIR, our Office of Nuclear Security and Incident Response like that to arrive at

the current rule text that I showed you on the previous slide like that. And made a number of -- I'll be honest -- late night changes to the preamble and to DG-1414 to incorporate those types of changes like that. In a few slides, I'll hand over the presentation to Keith Compton who's going to show you some MACCS calculations that he's done that are looking at the suitability of the AERI entry conditions and some interesting things.

But in the second part of this view graph as Jesse had explained before, the idea is to enable operator licensing like this and specifically the use of generally licensed reactor operators like that. And I'll refer you to their white paper, the human practice white paper and which in term cites DOE Handbook 1224 which talks about how to perform hazard and accident analysis. And you'll see a lot of the same terms in there with systems that are designed to survive the event, that type of language. Next slide, please.

In addition to allowing an applicant to perform an area in lieu of a PRA, the AERI entry conditions were also proposing they would be used to determine when an applicant would need to address the mitigation of beyond design basis events in 53.44.20.

In other words, if they met the AERI entry conditions, that requirement would not need to be satisfied, and similarly, combustible gas control requirements in 53.47.30(a)(7) like that. And this we discovered in talking that the proposed AERI entry conditions in combination with other conditions would be used to determine when a plant is a self reliant mitigation facility that enables the use of GLROs.

MEMBER HALNON: Marty, this is Greg. Just real heads up for Jesse for tomorrow. Take a look at the language here. It says may have generally -- may have GLROs.

The language in 800 kind of alludes to me that it's required to have GLROs if you meet that. So when we get to the discussion tomorrow, we can talk about that. Maybe I'm reading it wrong.

MR. SEYMOUR: Yes, this is Jesse. And so just to confirm -- and I apologize if there's a discrepancy in there. The structure of the rule language is such that when the criteria are met, those facilities must be staffed by GLRO.

So it's not an option. It's actually like a conditional break point where facilities on one side of the line have traditional SRO and RO staffing. Facilities on the other side of the line, the so-

called self reliant mitigation facilities have GLRO.

So again, in earlier versions, it had been option. And I apologize if that carried forward. It's now, like, a mandatory divide between the two.

MEMBER HALNON: Okay. So the slide is not right, but the language is correct?

MR. SEYMOUR: That's correct.

MEMBER HALNON: Thank you.

MR. STUTZKE: Yeah, I apologize, Greg. It's hard to keep up sometimes.

MEMBER HALNON: I get it.

MR. STUTZKE: Okay. Slide 48, next slide. We've added rule text that I don't believe we previously discussed with the committee on the maintenance of risk evaluations. That's patterned largely out of 50.74(h).

And I provided the rule text here. But one thing I wanted to emphasize in the slide is the difference between maintenance of risk evaluations and the upgrade of risk evaluations. They have very precise definitions.

I provided them to you below from a non-LWR PRA standard. And those definitions are the result of a multi-year discussion among the standard developers, the Joint Committee on Nuclear Risk

Management, or JCNRM. But the idea is that -- okay, so I go to the second definition.

So PRA upgrade, a change, and the PRA now requires that you apply one or more supporting requirements at a higher capability category and things like that. Items that haven't previously been peer reviewed in the PRA, the use of a newly developed method or method in a different context, that sort of thing. But what's key to understanding PRA upgrades is the standard requires that they be peer reviewed.

In contrast, PRA maintenance, if anything, that it's not an upgrade. And the standard does not require that they be peer reviewed. For example, if you're merely incorporating operating experience into your PRA, the assumption is that the methods for performing the data analysis have already been peer reviewed and you're simply exercising those methods like that.

So we tried to stay away. We've not used the term PRA update because that's vague. You need to think in terms of maintenance or upgrade. Anyway, enough on that. Next slide, please.

These are the questions that we are proposing to incorporate in the Federal Register Notice to seek comment from the public. And

understood, earlier, Dave, that the committee or individual members might provide some feedback as well. And that would be wonderful to us.

So first question is probably asking, should we even retain the AERI approach under Framework B? Remember that AERI is a change in the Commission's policy. It currently requires all plants to do PRA.

And if so, should we change the proposed criteria or the approach like this? And we're looking for some constructive feedback. Please tell us why you want to do this and how it can be changed and things like that.

MR. BLEY: Marty?

MR. STUTZKE: Yeah.

MR. BLEY: A process question for you. If you keep it, do you have to go up to the Commission with a policy paper beforehand or just setting the rule up with this in it is sufficient?

MR. STUTZKE: Well, realize the rule is transmitted through a SECY paper. And that will be a policy statement. And we have in addition to AERI, there's some other policy-related issues that the Commission will have to decide upon and direct us.

MR. BLEY: Okay, thanks.

MR. STUTZKE: So it's all done at one time. The second thing is are there other ways that we could leverage the AERI entry conditions, for example, physical or cyber security, access control, things like that. If so, what programs and how could we do it? Do we need to change the proposed rule text to enable that, things like that. And the third bullet goes back to the idea of the criteria and using them to use generally licensed reactor operators.

MR. BLEY: Another question, Marty. Since you came out with AERI the first time, have you had any public meetings with interactions with stakeholders? And if so, have you heard anything back on the entry conditions? Are there places where people have rationales for you to maybe weaken the entry conditions somewhat?

MR. STUTZKE: We have heard a comment that the AERI entry conditions are overly conservative in the sense that the concern is that they may be so prohibitive that nobody could actually meet the entry condition.

MR. BLEY: I call that restrictive. But conservative would imply there's a safety reason why they should be less restrictive. Has anybody tried to testify that to you?

MR. STUTZKE: No, we've heard the comment and the notion that there are other ways of doing risk evaluations other than PRAs. But nobody has suggested changing the dose distance criteria to something more generous or replacing it with some other text.

MR. BLEY: I was just curious about that. Thanks.

MR. STUTZKE: So with that, I shall turn the presentation over to Keith Compton. He will describe his confirmatory MACCS calculations. And hope you enjoy a technically oriented break from all of the discussion of rule text. So Keith, you're up.

MR. COMPTON: All right. Thank you. This is Keith Compton from the Office of Research. I'm going to turn my camera on very briefly so that you can see me. I'm going to then turn it off because of bandwidth and because my monitor -- I'm not going to be facing my monitor. And you would just be looking at the side of my head for the rest of the presentation.

So all right. So yes, so I'm going to talk today about some work that I had done to examine the relationship between the dose at 100 meters and the latent cancer fatality risk when quantified over ten miles which was conventionally the metric that

would be used to assess the safety goal. So could I have the next slide, please. So yeah, so this presentation, by the way, is going to be very narrowly focused.

I'm not going to be talking more broadly beyond what the implication is. This is simply if you know the dose at 100 meters, what do you know -- how much do you know about what the ten mile average cancer risk is? And the way I'm going about doing it, and this is building off the work that Marty had done, is the first thing I did is to come up, just reproduce a close form analytic approximation which is building off of what Marty had done.

The advantage of that is that when you do a derivation, you have to identify your assumptions in order to justify. So now that allows me to figure out how that simple approximation might translate into a more complex simulation. So therefore, what I would then do is just look at all those different assumptions and examine them using MACCS.

So instead of using the closed form, just use MACCS to see to see what answer MACCS will give you. One thing that's very important, all the analyses and the results that are in this presentation, they're where we are now. There's still

work to be done.

We're still error checking. We're still making sure we're working on the right questions. But I would emphasize that this is not the final work. Next slide, please.

So in order to come up with an expression, and I'll give the expression in a few slides. There's a certain number of assumptions that I have to make. One is that I am doing this assumption.

I don't include doses to individuals from ingestion. I can explain why that's kind of challenging. But it's consistent with how we would typically quantify the individual latent cancer fatality risk.

The second assumption is that the maximum individual dose at any distance R is assumed to be related to the dose at R0 following a power law. And this is important because if you know the does at one point and you know the functional relationship, then principally, you know the dose everywhere. The next assumption is that the material is released in a single plume.

And the reason for that is that you have to have some -- you have to understand how the dose varies, not simply radially away from the site but

also how it would vary off the centerline. But typically, the max dose is on the centerline. But that is not the does across the entire 360 degree mark.

We assume the population density is constant. That is independent of distance. And then finally we've made the assumption that the latent cancer constant -- the risk constant is -- it's constant and it's independent of does. So next slide, please.

So now here -- and as we get through the presentation, you'll see this is where most of the interest is. The -- in order for the dose to fall off with a 1 over n kind of relationship, there's certain assumptions that are kind of implied by it. One of them is that the does needs to be at ground level and non-buoyant.

In other words, it's not rising above the point of release or it's not released essentially above a receptor set. And the reason -- and I'll have slides that will illustrate the effective model is that if you have an elevated release or a buoyant plume, your dose actually can increase with distance until the plume impacts the ground and starts decreasing. So that can -- that would violate the

assumption used to develop the approximation.

Second is that protective actions to limit dose are not taken. So this analysis assumes that you're not trying to take protective actions. And again, the reason is that protective actions have the effect of constraining the dose and making the relationship between atmospheric concentration and dose, it breaks it.

In other words, if you take protective actions, you'll preferentially eliminate or reduce high doses. The third bullet is -- or the third assumption is that the plume is completely reflected at the ground and it's also unconstrained by a mixing height. And in the atmosphere, there's typically -- there's a boundary layer.

And at short ranges, the plume does not fill up that boundary layer. But at longer distances, the plume can expand large enough that it will reach an inversion layer and start mixing vertically. And so you no longer have a Gaussian distribution in the vertical.

And I've got, again, some things to illustrate that. And finally, the reduction coefficient is assumed to be the dose -- the dose reduction coefficient is assumed to be independent of

distance. And I'll show some examples of when that is and is not true.

CHAIR PETTI: I had a question here. I always thought that elevated releases resulted in less dose than ground level releases. But your rationale, is this just a relative term? It's a relative increase in concentration if the same material was released at ground level?

MR. COMPTON: Yes, and I'll show you something that maybe illustrates that point. The point is that -- well, I'll address that when I get to the slide which is I think --

(Simultaneous speaking.)

CHAIR PETTI: Okay, okay, great. Thanks.

MR. COMPTON: Sure. Next slide, please. Okay. That actually was the next slide. So again, the idea is that if you have an elevated release, your -- and if you can imagine, let's say you had -- now this was a buoyant plume. This is a plume that had I think 19 megawatts of energy. So it was very highly buoyant.

I think that's how I generated these curves. But what it shows is that for most of the curves at short distances -- and this is -- the scale is in kilometers. In short distances, the dose is

lower than it is as you get downwind.

And that's because the plume is basically overhead. The ground level concentration is if not zero, it's something very, very low. And then as the plume continues to move away and grow, then eventually the plume will contact the ground. The ground level concentration will start rising.

That is a function of the stability class, in other words, a very unstable condition which is the blue or marked A, grow very rapidly. So they fill up. They basically rapidly get to a uniform -- more or less a uniform distribution in the vertical if you're highly stable which normally would lead for ground level releases to high centerline concentrations.

It's still a high centerline concentration, but it's also keeping it from hitting the ground. So you have to go further and further out before you get your ground level concentration. So any questions on this slide?

Because this is kind of the key point. If you have a -- and I have a sensitivity where I looked at it. If you anchor your dose at 100 meters and then your dose increases with distance as opposed to decreasing the distance, you can see that you may have problem. I see a hand raised. I don't know who.

MEMBER BIER: Yeah, Vicki Bier. I have a question not on this slide but on the previous assumptions. I understand the reason for assuming uniform population density. But it seems to me not implausible that population density would actually be quite a bit higher at ten miles than right at the plant boundary. And have you looked at that also as sensitivity?

MR. COMPTON: Yes, and I do -- well, yes, my last -- and well, I've looked at it a couple of ways, some of which is in the presentation, some of which I wasn't able to get it into a form ready to assemble. But yes, I ended up with a sensitivity where I just put in an actual site population distribution because typically --

MEMBER BIER: Okay.

MR. COMPTON: -- population would -- typically population density increases with distance. I would note the interesting thing about this is that depending on the application if you had, let's say, a very remote site, it could be that most of your population might be close and not further away.

MEMBER BIER: Sure. Thank you.

MR. COMPTON: Sure. And the importance of population is that essentially it's a waiting function

on the average dose. If most of your population is clustered away, it's going to -- the average dose will be lower. If it's concentrated close, then it'll weight the doses closer. Okay? I see another hand up.

MR. BLEY: Yeah, this is Dennis, Keith, Dennis Bley. I don't know if you were here early in the meeting. If you were, you heard Vesna offer a lot of issues with respect to the QHOs. And the biggest areas here were in the consequence calculations. I guess I would say I've done some PRAs that have carried them all out to eventual consequences and others have done that too.

But can you address the amount of uncertainty in the consequence calculation, especially given the assumptions you mentioned earlier, and any way to determine if this calculation the way it's done currently is a near bounding calculation? Or is it kind of an estimate of central tendency? Can you say anything about that?

MR. COMPTON: I can say something about it. Whether it'll be satisfactory or not, I don't -- but I'll speak briefly about it. With respect to whether -- well, I'm not going to -- I won't weight in

to -- I'm not going to weigh in on the QHOs and whether one should use or should not use the QHOs.

So in terms of uncertainties from a purely scientific predictive point of view, yes, there are uncertainties obviously. Now this is going to be a judgment on my part. But some of the uncertainties that I would consider to be worth recognizing is that there are uncertainties in any atmospheric dispersion calculation, whether you do it for QHO purposes or any other purposes.

But those could be noticeable. Also, there are uncertainties in cancer risk estimation obviously, particularly at low doses. There are uncertainties particularly for calculating kind of a long term dose.

There are uncertainties associated with what are the actions that people might take in response to an accident. So there's clearly an uncertainty there. The one thing that I would note that those -- how to put it. There are what I would consider to be fairly accepted methods for addressing those. We have accepted methods for doing atmospheric dispersion calculations.

And so from that perspective, I would say the models, for example, are used in MACCS are

reasonably consistent with what other decision support models would use, the same with cancer. There are methods that have been used to -- in fact, so for example, the does coefficients that are used in MACCS and the risk coefficients are -- these are consistent with the approaches used in SOARCA with Federal Guidance Support No. 13. And then for long-term protective actions, this is something that we've acknowledged is that we use -- we typically use the intermediate phase relocation criteria as a surrogate for return criteria, recognizing that decision would be more of a political and social decision.

So now in this analysis, again, what I'm trying to do is compare if you calculated a dose -- using the same methods, if you calculated the dose at, say, 100 meters and then using methods that are kind of consistent with how we would calculate it for, say, the Level 3 PRA or any NEPA analysis, what answer would you get? So in a certain sense, it's a little bit narrower. If you calculated the dose using the methods that we would typically calculate, what would be the ten mile cancer risk also using the assumptions and methods that we would typically use? Does that make sense?

MR. BLEY: Yeah, that's pretty good. I

appreciate it. I'd just make two comments. One, the dose side of the issue, at least for low doses, is certainly an area fraught with some uncertainty. On the dispersion side, I have one example that I found pretty interesting.

Back when they invented the TMI containment, some colleagues of mine at the time were using models that are predecessors of the ones you're using today. But they were predicting where that release would go and had people up in a helicopter chasing it. And the predictions were pretty darn close to reality. That gave me a lot more confidence than I had previously. But go ahead.

MR. COMPTON: Okay. And one thing, one could have an entire separate meeting on the accuracy of dispersion models. I would note that that has been talked to by the American Meteorological Society, the accuracy of Gaussian models. And the other is that we've also independent of this work, we've done some recent work using a more state of practice model called HYSPLIT. And we're finding that the Gaussian model kind of in an average sense does not do terribly badly.

MR. BLEY: And there are specific kinds of locations where you get things that override that

quite a bit like lake effects and the like. That's good. Thanks.

MR. COMPTON: Yeah, okay. I see another hand up.

MEMBER DIMITRIJEVIC: This is Vesna. I have actually my least concern is about dispersion which you said it's the main thing. That's absolutely not what I think is main source uncertainty. And I appreciate all the developments in that.

In addition to those, the other important factor is timing. So my question is for how long time? This exposure in the cancer calculation all considered to come from plume? And what is the timing of that exposure?

So that's my question when it comes to cancer facility because as much as I saw Level 3 PRA, the cancer facility main exposure comes from land contamination and then the different timing related to that. And I assume that this is also part of the MACCS calculation. So my question is about time of exposure. Is it all related to plume?

MR. COMPTON: Well, and I'll speak when I get to the actual cases. I'll speak to the assumptions that I made. But just briefly, the calculations that I will do just assumed that you had

a release.

I use a 96-hour exposure period for the early phase, the plume phase which is more than enough for the plume to pass buy and deposit. And then I used -- and again, this is consistent with the Level 3. I used a 50-year exposure period to represent the long-term dose.

And then the dose and that long-term period is -- typically it's dropping because both radioactive decay and there are functions that we use in MACCS to represent the effects of environmental weathering on both the reduction in groundshine dose and the resuspension dose. And those are --

MEMBER DIMITRIJEVIC: So for this long-term exposure for 50 years, you assume there is no cleaning of the land done. Or what did you assume on evacuation? And do you assume how long people evacuate and when do they return? Do they leave there? I mean, there is so many questions I have about that.

MR. COMPTON: Sure. Well, and I think I'm going to -- I think I'll move on because I think that I will have addressed those in the further slides. So for example, I assumed no evacuation. So --

MEMBER DIMITRIJEVIC: So this much I think

of main sources of uncertainty, not this great mathematical model you have for dispersions. I don't really care about that uncertainty. I haven't said -- I can estimate those with acceptable level of uncertainties.

But everything which comes after that, I have a -- also, the land (audio interference). Feedback, but my main concern is not with this mathematical models. I think they have the dose calculation.

I think that you have acceptable levels of uncertainties there. All my main uncertainties come from these further assumptions. So the land contamination and what happened in the 50 years of that, about where the factors and things like that.

MR. COMPTON: Okay. Well, and I'll move on. And hopefully I will at least speak to some of those. I don't know if I will answer all the questions. But why don't we go on to the next slide because I might have something that addresses that.

Yes, actually the next one. So this is just illustrating the effect of protective actions -- modeled protective actions I would say on both early and late phase doses. This is actually out of the recently published Level 3 PRA that's been put out as

a draft for comment.

But it shows on the left you see what I did is I pulled out the dose versus distance on the left to the non-evacuating cohort. So that's for the early phase and on the right to the light phase cohort. And so what you can see is that I'm going to pick up the right first is that in MACCS the protective actions -- the MACCS will do whatever is needed to ensure that the habitability criteria are met.

In other words, they have acceptable dose levels. And the effect of that is that it keeps the does -- it essentially constrains the dose to be more or less flat until you get to the point where you're not needing to take protective actions anymore. So you can kind of see that.

You can see that for some of the release categories it was not very high close end. But it just didn't fall. Whereas for some of the more lower magnitude release categories, it was projecting that protective actions weren't needed and they kind of fell in the more typical fashion.

On the left, it shows the effects. Now this was relocation. So -- and again, this was for the non-evacuating cohort. So if you -- essentially,

it's showing that if you didn't -- if they were exposed to the plume, the dose drops off with distance.

But if you are able to relocate them before the bulk of the plume had arrived, you could actually -- you would kind of flatten out the curve. I don't know if you can see some of the -- there's a few figures there that are a little bit flat. The key thing -- I don't want to go into detail on all these results. But they just illustrate that protective actions tends to flatten those and result in a lower dose drop off. And then that would affect obviously the derivation. So next slide.

So now the next thing that I talked about, the things that could cause the dose not to drop off in a 1 over r to the n fashion is that if you have a mixing height that the plume can expand beyond. And so the figures on the right which I understand that you can't read, but they're just illustrations of some typical mixing heights that you would get across the United States. And so what you get it the mixing heights in the morning can be anywhere from 300 to 900 meters, and mixing heights in the afternoon after you've had the insulation and sun exposure can be anywhere from 800 to 2,600 meters.

The figure on the left shows the standard deviation of the Gaussian plume as a function of the different stability classes. So again, the blue is Class A, highly unstable. What you see is that it rapidly vertically mixes.

And so it's going to start -- it's going to essentially hit the cap and start -- then your reduction is not going to be as fast as you have sequentially more stable conditions. You may get to the point where you go out a long distance and you still have not vertically mixed. All right. Next slide. Now the assumption that the power law coefficient would be constant, these are just some -- these are the -- some of you may be familiar with these.

These are the Pasquill-Gifford diffusion coefficient curves. And what you can see if that transverse dispersion, dispersion in the cross wind or y-direction, it's pretty much a straight line on a log-log plot. So you can represent those curves with a single value for N.

But vertical dispersion generally doesn't follow a power law. And so you can see that they're not straight lines. That's the only message to take off of this is that you can't -- vertical dispersion

which would affect the dilution afforded by dispersion is not necessarily going to be represented by a single constant.

Under certain conditions, it's not bad. But it's not a uniform thing. Okay. Any questions on that? I don't see any hands. So we'll go to the next slide.

Now one other thing that as I mentioned, you have to -- if you have the downwind dose and the rate that it drops off with distance, your problem is not fully specified. You also have to specify how the dose varies off the centerline. Now one could simply just assume that the plume fills in to one 22.5 degree sector, in other words, 1/16th of the arc. So you could model those just as a top hat.

What I tried to do is to model the actual kind of average concentration at a certain radius by just averaging the Gaussian over the circumference of the circle. So I'm not going to go into this slide in a lot of detail other than you do have to -- you have to make some kind of assumptions. And one of the things that I'll point out is that if you have multiple plumes meaning that everything doesn't come out in one pulse, your distribution azimuthally is not going to be Gaussian anymore.

So it makes it hard to do the derivation. But this is all a part of what we're trying to come up with, come up with the analytical approximation. Next slide, please. So this is -- there's not a lot on this slide other than to basically say provided that you have met those various assumptions, you can develop a closed forum solution. So you can look at how the -- basically, all you're doing is you're calculating the average.

You're taking a dose at one point and then calculating it as an average over a region. And provided that your assumptions hold, the analytics should be the same as the numerical. And then if you have the average dose and you know the cancer risk per unit dose, then you can calculate a cancer risk.

And the nice thing about this approximation is that you can calculate it any given set of distances. It's not dependent on being -- the inner distance being 100 meters or the outer distance being ten miles. So nothing more about that other than this is the equation that I'm using to compare MACCS to the analytic. Next slide, please.

Okay. As I mentioned, what I did is that I developed a set of MACCS modeling cases. I'm going to be going through those to examine the impact of

those various assumptions. I'm going to use some source terms from the Level 3 to represent some different source term characteristics.

And kind of this is the key to the methodology is that I basically scale the size of the release to get exactly 25 rem lifetime dose at 100 meters. So I do that by basically taking the source term with the full size core and then just calculate how much smaller would it need to be in order to get to 25 rem dose. I would mention that I did this on 25 rem, not on the PAGs.

I've got a slide that speaks to that at the end. And then last bullet is that I used just combinations of constant weather conditions, constant population density. And then I used some SOARCA meteorological files and site files to look and sett how much the answers would change if you put something more realistic in. Next slide.

So the source terms that I used, so as I mentioned, all of them were inventory scales to get exactly 25 rem dose. The base case plume is an interfacing systems LOCA, then I have a few others that I'm using as sensitivities to see if different types of source terms cause the results to be different. And these are just some characteristics.

And one of the things that may be worth noting, I mean, this is -- these source terms obviously were developed for a large light water reactor. They're not source terms that would be used for a non-light water reactor or basically any other technology. But what they do is they offer a range of source term characteristics that might impact my analysis.

In other words, I've got some that are very early, some that are fairly late. I've got some that have a relatively short duration. It's a short duration release, some that are much more prolonged release.

So the -- and some that are relatively more enriched in noble gases and some that have relatively more volatile fission products. So the idea here is not to try to claim that I've covered every possible source term. But I wanted to get a diversity of source terms that kind of cover the attributes of a source term that could affect the results. So next slide.

And then so here are the cases that I looked at. So I start off with a case which is designed to be as close as possible to use MACCS to mimic the assumptions that I made in doing the

derivation. I set the boundary layer heights to its maximum height.

I used an approximation which allows me to use just a straight power law. And I'll talk about that more. But the idea is that I start with as simple as possible and then I start adding complexity in.

So Case 1 goes in and uses the Pasquill-Gifford stability classes and a few other things. And then I look at the effect of having a buoyant plume. And then I look at the impact modeling like effects.

So you can read down through here. But the idea is just to sequentially add things such that by the end, I've got something which is a little bit more representative of how we would model an actual source term. I'd point out that the -- in Cases 0 through 4, those are modeling single stabilities at a time, in other words, A stability, B stability, A through F.

When you star weather sampling, obviously you have a wide range of stabilities. So there are other -- the cases are very -- on other attributes besides stability. Okay. Next slide. And all the rest -- basically, the rest of the -- most of the rest of the presentation is going to be a slide like this,

just with the different assumptions. So the simplest case, they used a power law.

They have constant weather conditions. It was A through F, constant wind speed, no rain, very high mixing layer because I didn't want it to reflect constant deposition, velocity. I'm not going to read through all these. But the idea is that they're supposed to be very simple.

Fitted n, there's a column that says the P-G N and the fitted n. The P-G N is what kind of theoretically you would expect the dose reduction coefficient, if it was purely following Pasquill-Gifford power law. The fitted n is when I ran the model and I just fitted a power law representation to the curve.

And those curves by the way for each of these cases there are some selected dose versus distance curves as supplemental slides in case we wanted to refer to them. And for each one, you see that the overall, the dose, the combined early and prompt phase dose is exactly 0.25 sieverts or 25 rem. And then this gives you a scale so that you get that overall dose, what is the early phase dose?

What is the prompt phase dose? And then what is the -- the next column is what is the ten mile

cancer fatality risk? So again, the overall dose, first column, the ten mile cancer risk is in the fourth column.

And then the second to last column is the results of the analytic calculation. And then the final column is the difference. So just a few things to observe about this slide is that I can get -- I'm getting different -- for a variety of reasons, but at least because I get different values of n for different stability classes.

I get different ten mile cancer risk results from MACCS. But all of them are less than 2 times 10 to the -6. And the differences -- the approximation ranges from very good for stable conditions, 0F. That's at 3.6 percent degree difference.

It's off for unstable conditions. I believe that's largely due to the effect of the vertical -- effect of the cap. But I'm still trying to understand why is it not exactly right and is it for explainable reasons. So next slide.

I'm going to do something very similar. But I make the boundary layer something a little bit more reasonable, 1,000 meters. I use the non-spatially constant power law coefficient. I'm using

Kotechek (phonetic) as just -- it's a piecewise approximation to the vertical dispersion coefficient.

So those are implemented into MACCS. My deposition velocity, I let it be based on what the results that were associated with that source term were. Instead of using an effective dose cancer coefficient, I use the organ specific cancer coefficients.

So that's the difference from the simplest case but still single stabilities. And so again, observations, the 25 rem lifetime dose because ten mile cancer risks ranging from 1.4e-7 to 3.3e-7. The difference between the MACCS and the analytic calculation ranges between 40 percent and 264 percent.

Again, the analytic calculation seems to be conservative with respect to the MACCS calculation. The short way to see if it's conservative or not is that if the percent difference is positive, the analytic calculation is higher. If it's a negative number, then the analytic calculation is lower.

But again, all the cases produce a cancer risk that's below 2 times 10 to the -6. And I should emphasize this is -- these are all conditional results. So when this is 2 to the -6, this is not multiplied by any kind of frequency.

This is a risk that is basically the -- it's the average cancer risk among the ten mile population given that you have the source term. All right. Next slide. So now I look at plume buoyancy. And if you recall, I said that you if you fixed your calculation so that you get a 25 rem dose at 100 meters, you got there because you had plume buoyancy and essentially your plume might've been overhead at that point.

Your ten mile cancer risk could be higher. And you would kind of expect that. If you anchor at the same anchor but then let it increase instead of decreasing, you'll get a higher average dose and a higher average risk.

So again, it ranges between 2.5e-5 to 6.1e-3. The approximation -- the analytic calculation is anywhere from negative -- I should've said -38 percent to 566 percent. The key is that the analytic can be either conservative or non-conservative.

What you do see is that the fitted value for n can be negative which implies that on average the dose is increasing which, again, makes sense if you look at the figure of plume rise that concentration can increase beyond 100 meters. Next slide. So then I decided to look at -- this was the

-- I decided to look at wake effects to see whether wake effects would impact the results. And so I used the -- this is basically using the new near-field capability we put into MACCS.

And we're using what is called a Ramsdell Fosmire model. It's essentially the same mathematical relationship for dispersion with distance that's used in the ARCON Model. So it accounts for the fact that you can have plume meander and wake effects.

So again, just something to try to bring a little bit more realism or complexity into the calculation to mild cancer risk between 5.5e-7 to 1.9e-6. The analytic calculation is generally conservative with respect to the MACCS calculation, not always. But they do all produce cancer fatality risks less than 2e-6 even if it's only barely under stable conditions. Next slide.

So now when I model protective actions, again, I'm predicting that the effect of my protective actions is to have a lower value for n. And you see that. Instead of having values for n that were in 1.6 to 2 range, these are values that tends to make the curves drop off -- or not drop off very quickly. It's about one.

And what you see is the effect of when you

credit protective actions, you're -- the analytic calculation by the way did fairly well. But it was generally non-conservative. But you're getting something above to e-6 when you model those protective actions. And again, I think largely because you're flattening the curve. Next slide, please.

Now I start moving beyond using single weather trial commissions and using more diverse set of weather conditions. So I sample the -- from a meteorological file both with and without buoyancy. I think I should have said -- I didn't put it on the slide.

This is -- I'm sampling the weather, but I'm still releasing everything as a single plume. I just took all the plumes in the original source term and just compressed them into a single release so that a plume only goes in one direction. But now it can go in different directions with different wind speeds and different stabilities.

Again, the difference is between MACCS and analytic is between 20 to 40 percent. The analytic calculation is conservative. You are below -- in both cases, below 2e-6. Next slide, please.

Now I relax the condition, and it all has to come out in one plume. And I allow it to

essentially come out with the time dependence that it would've been modeled in the Level 3. And I looked at -- for this, I looked -- this is where I started looking at different source terms.

I use one which again I said it was more of an early post type release and then the late containment failure which was a very prolonged release and then another containment failure source term. Again, scaled them all so that they would get exactly the same dose. And just again note that you're below 2e-6 when you do multiple plumes and you sample weather.

Now one thing, I just had a little footnote saying that in order to do the analytic calculation that's kind of challenging, I have to pick a transverse dispersion coefficient. I picked what I assumed was highly unstable. It seemed to work.

But at this point, you're really not -- it's really hard to actually say what would the right value be for the analytic calculation. It's pretty different than the base case assumptions. Next slide. And now -- so again now I've added on weather sampling.

I've added multiple plumes. And now I introduce instead of a constant population density, I

introduce spatially variable population density. And I think, yeah, I used it based on Peach Bottom.

And the -- so again, now this is getting about as far away from the assumptions used to make the derivation as I could get. But the -- so the differences, they're ranged between 180 percent to almost an order of magnitude. But they do tend to result -- they all resulted in cancer fatality risks that were lower than 2e-6.

And I think I observed that they were lower than the constant population density as well which would make sense again if you're concentrating your population further away where the doses are lower. Your weighted mean is going to end up being lower. So next slide, please. So what I didn't pull together is that much of the reasons I believe for the thing that drives the relationship between the 100 meter dose and the 10 mile average cancer risk or average dose is basically how fast the doses drop, the concentrations and the doses drop off with distance.

So I just put it in a scatter plot all the various different fitted values for n. And so you can see there's a fairly clear relationship that the slower your dose drops off with distance, the higher your average risk will be for a given 100 meter dose.

So again, that should make sense from a -- just from a first principles basis.

But I just wanted to plot it to see if it's holding up. So all right. Next slide. So now the next thing is that in order to do the -- examine the relationship between dose at 100 meters and the ten mile cancer risk, I have to pick a dose that I'm scaling everything to. But in this slide, I was trying to understand how doses might vary over time.

So this slide is where I basically did a case for some different source terms to see -- now this is only looking at the long term dose. But I essentially took my three different source terms and I scaled them all to get exactly 2 rem in the first year. I did this by modeling just a one-year exposure period, and then I just sequentially added -- increased the exposure -- the long-term exposure period until I got a total of 50 years and then took the difference to figure out the dose.

And so what you see is they don't all drop at the same rate. And also, I put in the early phase does that it took to get exactly 2 rem. And so what you see is the difference -- well, I'll just read the bullets.

The accumulation of dose and long-term

phase occurs at different rates for different source terms. And the insight from this is that there's no fixed ratio between early phase dose, the first year dose, and the 50 year dose. In other words, I don't know yet how I could design something that would exactly meet 1 rem in 96 hours, 2 rem in the first year, and 500 millirem in subsequent years.

But what I would note is that for the scale source terms that we used in this analysis, if you meet the 2 rem intermediate phase relocation AG, you'll probably get a lifetime -- it appears that you're going to get a lifetime dose less than 25 rem. The lifetime dose could be anywhere from 5 to 10 in this analysis. So the significance of this is that all this analyses that were done anchoring everything on a 25 rem lifetime dose, if you did have something that met the criteria, you'd probably get a lower lifetime dose. And therefore, you'd get a lower lifetime cancer risk calculation. So next slide.

So in summary, we developed the analytic derivation of the relationship between the lifetime dose at a single point and the ten mile average cancer risk and used that to come up with some assumptions to design test cases. Generally, the 25 rem dose at 100 meters corresponds to a ten mile population weighted

lifetime cancer risk, less than 2 times 10 to the -6 unless you have buoyant releases or protective actions that are accredited in reducing the dose. And in those cases, you can -- your dose reduction is lower or even increases with distance.

And again, next bullet, the actual relationship is sensitive to what you -- how you assume that the downwind dose reduction occurs. And then from the previous slide, there's no single -- there's no fixed ratio between the early phase dose, the first year dose, and the 50 year cumulative dose. Yeah, and then the last, for the scale, for the source terms we looked at in this analysis if you meet the 2 rem, you're probably going to get a dose less than 25 rem.

It's not on the slide. But I would mention that radioactive decay is always going to kick in. And typically these source terms are going to be driven -- much of the long-term dose is going to come from cesium-137, cesium-134. 137 has a 30-year half life, but cesium-134 has about a 2-year half life.

And you've got some other shorter lived. So it's likely that your dose is going to drop. It's going to be less than 27.5. In other words, if you -- it's going to keep going down.

There's also -- I've done some -- I've been trying to do some work to figure out if you use the weathering factors that are currently used in MACCS to reduce the dose, I don't remember them off the top of my head. But essentially -- and this is based on some data from Chernobyl -- about half of the initial dose decays with a fairly quick half life due to weathering -- simply due to weathering, like, with a half life on the order of, I think, a year or so or maybe less. And then about half of the dose -- it's a two compartment model.

Half of the dose decays -- drops off because of weathering with a much longer time period, like a 90 year dose. So you get that immediate weathering effect as the positive material kind of migrates down into the soil, gets covered up, and weathers. So it drops rapidly at first and then drops off more slowly.

I think that is my last slide. Go to the next slide, please. My bibliography, next slide. Yeah, and then these are just the supplemental slides that just show how weather is dropping off and kind of -- so for example, this one shows under Class A as simple as I could make it.

It still managed to fill up the bounder

layer. And so it did not drop with 1 over r relationship. It did out to about a few kilometers. And then it starts dropping off more slowly because the reduction is only due to transverse dispersion whereas under Class F.

So much more narrow plume, but it drops off more slowly but it keeps dropping off. So I'm not going to go through all of these unless folks have a question about a specific one. So that's all that I have.

CHAIR PETTI: Members, any questions?

MEMBER DIMITRIJEVIC: You know, I have a feeling you've been discussing some things which we understand better than other when you were discussing that. Like, we were talking in light and then looking the dark parts of the problem, you know, when we have much more uncertainties connection, those leading to cancer. I also was wondering what are the exposure in this. This exposure, you said the plume exposure was only analyzed for the four days. And after that, it comes from the positions, right?

MR. COMPTON: Right.

(Simultaneous speaking.)

MR. COMPTON: Go ahead.

MEMBER DIMITRIJEVIC: So this land, the

positions, what would be -- what is the background, the exposure to the people who live in this area? I mean, would that be considered acceptable? I mean, there's a lot of questions I have. But let me just ask you some general question. What kind of doses the MACCS uses to predict this cancer fatality?

MR. COMPTON: What are the dose coefficients?

MEMBER DIMITRIJEVIC: Yeah.

MR. COMPTON: The dose coefficients are derived from Federal Guidance Report 13. And --

MEMBER DIMITRIJEVIC: When was this issued?

MR. COMPTON: 1999. It's the most -- I think they're updating it. I think they have FGR 15 out for external dose coefficients. I could be wrong, but I don't think they've put out the updated one. But those, I'm not expecting the -- now that's the dose. That's essentially the exposure to dose coefficients.

The risk coefficients that were used were based on the risk coefficients that were used in SOARCA. And they were provided by Keith Eckerman. And they're also essentially consistent with FGR 13.

So they're consistent with federal

guidance. And that kind of goes to I think a statement that I made earlier is that I recognize the uncertainties in it. But I would say the use of the Federal Guidance Report 13, it's an accepted method. One can certainly argue about the uncertainty and everything else in it. But it's as good as we can make it.

MEMBER DIMITRIJEVIC: All right. But the results you reported from MACCS are all mean values?

MR. COMPTON: Well, yes, for anything with meteorological sampling, I reported the mean values. For the single weather trial, MACCS is going to take it's statistics over the number of weather sampling trials. So if I do a constant weather condition, that's just the value that it is. If I do it over a meteorological file where I'm sampling from different weather, that's going to be the mean value across all the different weather conditions.

MEMBER DIMITRIJEVIC: So does MACCS report to you the distribution the 95 percentile?

MR. COMPTON: Yes, yes. That's actually -- yes, it does.

MEMBER DIMITRIJEVIC: Do you know what distribution MACCS runs over different -- not meteorological factors but other factors like a risk

factor?

MR. COMPTON: Sure. So MACCS is set up that typically you would run MACCS -- MACCS will always do if you tell it to a sampling over weather conditions. But it will use single point estimates for all other parameters. It does have the capability to -- you do have the capability to sample other parameters. And that's what it was done in the SOARCA of certain analysis is they sampled a selection of MACCS parameters, came up with distributions, and then sampled them.

(Simultaneous speaking.)

MR. COMPTON: And not surprisingly --

MEMBER DIMITRIJEVIC: -- risk factors, things like that. So then you had some feeling what type of distributions if it's not meteorological data?

MR. COMPTON: You mean whether MACCS --

(Simultaneous speaking.)

MEMBER DIMITRIJEVIC: No, no, no. You just explained to me they use a point estimate for everything other than meteorological data, right, in these runs which you have performed. But you said that there were runs performed as a part of SOARCA analysis. We consider other uncertainties other than meteorological like a population density or like risk

dose, or the time exposure.

(Simultaneous speaking.)

MR. COMPTON: Right. And some of those --

MEMBER DIMITRIJEVIC: Do we have any feeling what type of certainty we are talking when these other factors are considered?

MR. COMPTON: Well, if I recall, this is from -- there's been a number of SOARCA uncertainty analyses. I think one of the things it does tend to show up -- well, a few things tend to show up as significant. One is usually the source term, the characteristics related to the source term. So obviously if you -- any uncertainty you have in the source term propagates into the Level 3. But of the MACCS parameters by themselves, the cancer risk coefficients --

MEMBER DIMITRIJEVIC: Right.

MR. COMPTON: -- tended to show up as the most significant. I think I got to be careful because Tina is not here to keep me on the straight and narrow. But I believe -- and that makes sense.

It's a linear -- that's just a linear multiplier at the end of the calculation. But there is -- and I don't have it memorized. But there is a published distribution of risk factors.

But again, in this analysis, I'm doing it the way that is fairly consistent with state of practice. We use kind of a single point estimate value. And I can't remember if it's the 50th percentile.

And we also have a -- we also sample from the central tendency that the recommended dose and dose rate reduction factor which is also a distribution to account for -- the dose and dose rate factor for this, don't think that that would -- the uncertainty would be that important because if you constrained your doses to be in the low dose regime, you would -- well, I'll be careful. I'm not going to say --

(Simultaneous speaking.)

MEMBER DIMITRIJEVIC: Okay. Well, you know, I don't really have any issue to take with the AERI criteria except I think it's overly complicated. My -- I'm reflecting on my thinking on acute dose.

That's why I'm asking you this because we don't really have -- we have never seen uncertainty of the MACCS results. And somebody told us through these multiple meetings that they're small which is very much against my beliefs. As you say source term has a high uncertainty.

So basically, uncertainties in the PRA, everybody know they high Level, but they high in Level 2. In my opinion, the highest in Level 3 based on my experience. So I mean, for me, I was trying to measure those uncertainties because if the cancer -- this latent cancer risk would be our risk measures.

We should really have some -- we should really believe that we can actually evaluate that with some reasonable certainty. And that's why I sort of question because you talk about meteorological data. And obviously, the very good models develop them, mathematical models.

But there is so many other important factors. Is it 50 years? Is it -- do they ever? Do they come back? Is the land going to be clean before they come back as I point out?

And then comes the risk dose which is the major factor. And there is a huge uncertainty associate with it. Thank you. Thanks for your presentation. I learn more about MACCS than before. So appreciate it.

MR. COMPTON: Thank you. Any other questions?

CHAIR PETTI: I'm not hearing any. So thanks so much again. We've been at this now -- let's

see. It's 2:43. I'm just thinking maybe we should take a short break now and then we've got about 20 slides left, maybe 17 slides. So why don't we take a break to the top of the hour, and then we'll come back. And these are the last two sets of presentations. Thanks.

(Whereupon, the above-entitled matter went off the record at 2:44 p.m. and resumed at 3:00 p.m.)

CHAIR PETTI: Okay, it's the top of the hour, so let's keep on going and start with Draft Guide 1413.

MS. BIRO: Okay, I'll take it up. So good afternoon, my name is Mihaela Biro, I'm a Senior Reliability Risk Analyst in the Division of Risk Assessment in the Office of Nuclear Reactor Regulation. And I'm going to talk to you about Draft Guide 1413, which also goes as proposed new Regulatory Guide 1.254, for technology-inclusive identification of licensing events for commercial nuclear plants. Next slide, please.

So as a refresher, this guide applies to all the framework, all light water reactors and non-light water reactors licensed under Part 50.52 and 53 for Frameworks A and Framework B. As any guide, this comes with three section.

Before I go there, a refresher that the term licensing event is a generic term we chose to use in this draft guide to -- because the guide applies to all licensing frameworks.

I'm going to turn my camera off because it's -- I think I have bandwidth issues.

So the licensing events is a generic term we use in the context of this reg guide to refer to those collection of designated event categories identified in Parts 50.52 and Part 53. So this draft guide has three sections.

Section A is dedicated to introduction and a view of applicable regulations. Section B provides a discussion and an overview of the ACRS recommendation. And Section C provides the staff guides, which outlines an integrated approach for identification licensing events.

And this integrated approach comes in three main aspects. One is the systematic and comprehensive search for initiating events, meaning identifying all possible perturbation to the plant that can challenge the control and safety systems. This work needs to start with a blank sheet of paper without preconceptions or reliance on predefined lists.

Second part of this is the delineation of -- the delineation of a comprehensive set of event sequences, which is the analysis of the plant response to the initiating events. And finally in Part 3, grouping and mapping those initiating events and event sequences into licensing event categories.

Lastly, this guide also contains an appendix that reviews the techniques for searching for initiating events and provide a list of these for references but does not recommend any particular technique. Next slide, please.

So since from -- since last time we presented at the Subcommittee meeting in June, we revised the two tables we had in the previous version of this guide and combined them into one large table which attempts to summarize the licensing pathways and the licensing event categories. It looks quite a busy table so I'll try to briefly walk you through it.

So in the first column we've captured the various licensing frameworks, such as Part 50.52, 53 Framework A and 53 Framework B. Looking at the second and third columns, we noted that the guidance related to the licensing modernization projects, also known as LMP, which includes NEI 1804 and Reg Guide 1.223.

This guidance applies only to non-light

water reactors at this time, and so on the second column, we have to differentiate between light water reactors and non-light water reactors.

Also going down to Framework A, note that the existing LMP guidance does not currently apply under Part 53 Framework A. But in the future the staff intends to revise Reg Guide 1.223 to address licensing under Part 53 Framework A.

Moving on to the fourth column, I'll summarize the licensing event categories under each framework. You've probably seen that before in a previous version. So note that Parts 50 and 52 do not have clear definitions and the list on this table includes everything that was identifying regulation associated regulatory guides.

On the second row, entry, if LMPs use with comments on only licensing event categories that were defined in LMP guidance and so on. Release the licensing event categories under Part 53 Framework A and Framework B.

Finally --

MR. BLEY: This is Dennis Bley. The row on Part 53 Framework A, when you read through, it says LMP is not applicable. I don't understand that. I thought that was the whole purpose of Part 53,

originally.

MS. BIRO: Yeah, but it just -- it's, we have to go based on the status code. So if you go and open Regulatory Guide 1.223, it currently says it's not. It doesn't list Part 53 Framework A.

MR. BLEY: So the Reg Guide doesn't list Part 53. But Part 53 essentially asks for LMP.

MS. BIRO: Yeah, it's built upon. So this is something that came out during our review with the -- with the little council. So we just had to reflect the present state as of yesterday.

MR. BLEY: But it's not that LMP doesn't -- isn't applicable to Part 53. LMP isn't applicable to the reg guide because the reg guide doesn't say so.

MS. BIRO: Yeah, and I think you're also getting into those, if you look in the next, in the licensing events, right, the terms that are being used.

MR. BLEY: Yeah.

MS. BIRO: And Framework A has, for example, micro sequences while they -- the guidance has DBs, BDBs, etc. So we'll have to address that. It's a technicality I think, yeah.

MR. BLEY: Yeah, I guess so. It's the logic of the display that's bothering me. It seems to

me when I read Framework A, LMP is perfectly applicable. The reg guide you can't use because it says you can't use it. But, and that's your guidance for using LMP. Anyway, you're going to fix it, so that's.

MS. BIRO: Yes, that's the point, that's the point. It's just not applicable at this very moment, I would say.

MEMBER REMPE: Dennis, if you looked at the table in the draft guide we were given, they've got a footnote saying that they plan to update it. So maybe it's just this slide that's bothering you?

MR. BLEY: It's the language that says Part 50 -- LMP is not applicable to Part 53. To me, LMP's not applicable to the reg guide. That's clear until you fix the reg guide. But LMP ought to be applicable to Part 53 Framework A because it essentially tells you to do that.

MEMBER REMPE: Yeah, I guess I thought the footnote, it didn't bother me when I looked at the table. But it does have an N/A, but it has a footnote right there saying we're going to update it. So maybe it's just the way it's worded with the footnote.

MR. BLEY: Yeah, if I were -- if I were doing the table in the reg guide, I would just have

the footnote, I wouldn't say not applicable. But anyway, go ahead.

MS. BIRO: Yeah, it's very hard to capture all the subtleties in a few words, but I appreciate the comment. We'll see if we can improve the text.

MEMBER HALNON: Will the revision allow the light water reactor --

MS. BIRO: Excuse me, I didn't?

MEMBER HALNON: Would the -- this is Greg. Would the revision include light water reactors? I know it obviously includes non-light water, but.

MR. BLEY: Revision of the reg guide.

MS. BIRO: Yes.

MEMBER HALNON: Yeah, for Part 53. Okay, it will be both those --

MS. BIRO: I believe so. We haven't gone through all the detailed discussion on that, but I see no reason why not. But I guess we'll have to take back and yes.

MEMBER HALNON: Okay, thanks.

MR. STUTZKE: Greg, this is Marty Stutzke. I'll note NEI 18-04 itself says that it only applies to Parts 50 and 52 non-light water reactors. So it's more than updating Reg Guide 1.233. NEI would have to update its guidance as well.

MR. BLEY: Well, wait a minute. You as the regulator, if you update Reg Guide 1.233, can right there say that from a regulatory point of view, LMP is appropriate to Part 53. NEI isn't a regulatory document.

MR. STUTZKE: True, but Reg Guide 1.233 endorses NEI 18-04, so.

MR. BLEY: It could, with the exception that it also applies to Part 53. Then you'd be done.

MEMBER HALNON: It would be good to clear everything up. So I'm sure this --

MR. BLEY: I think it would but making yourself wait for NEI, if you have to wait for it, doesn't seem to make sense to me.

MEMBER HALNON: I'm good, you can go on.

MS. BIRO: Yeah, okay. All right, well, thank you. So moving on to the last column, the summarize, the use of a PRA is required. So we noted that under Part 50, a PRA is not required at this time.

However, there is some rulemaking activities. SECY-2252 described the NRC proposed changes to the regulations in Parts 50 and 52 to align reactor licensing processes incorporating lessons learn from new reactor licensing.

So the NRC is proposing to any regulations to Part 50 to require the construction permit and operating license applicants to submit a description of the plant-specific PRA and its results.

So under Part 52, a PRA is required. Under LMP, a PRA is implied. And then moving down, of course Framework A also requires a PRA. And then when you lastly on the, moving on to Part 50, Framework B. An applicant may elect to develop an AERI as an alternative to a PRA if the entry conditions are met.

So in summary for a stable, the choice of licensing framework influences the process to be followed for the licensing event identification. And that it establishes what licensing event categories will be used, whether PRA will be used, and how those risk insights from the PRA will be used. Next slide, please.

MEMBER HALNON: Just one, just a follow up so that Dennis and I don't bring it back up. Do you have an approximate schedule for the 1.233 revision just so we can see how that all works, or is that still to be determined?

MS. BIRO: I believe it's to be determined. I don't think we have that.

MEMBER HALNON: Okay, it'll be prior to the

53 being out for final rule, I would assume, right. Since it's guidance to work Part 53.

MS. BIRO: Yeah, I can't answer that. Marty, do you have any thoughts?

MEMBER HALNON: Maybe that's just a suggestion to get it out, you know, next year some time.

MR. STUTZKE: We'll take that back.

MEMBER HALNON: Thanks.

MS. BIRO: Thank you. Any other questions? If not, moving on to the next. So on the next four slides, I will walk you through the approach outlined in Section C of the guide for technology-inclusive identification licensing events.

You've seen this before at our previous engagements. Before we got into the flow chart, we identified a five overarching principle that are color-coded.

So NEI will identify application-specific factors. Orange, conduct a systematic and comprehensive search for initiating plants. In blue is a systematic process to delineate event sequences. In green group the initiating events and event sequences into the designated event categories according to -- licensing framework. And lastly,

right, provide assurance that the set of licensing events is sufficient. Our next slide, please.

So before I review the process on the flow chart, I'd like to highlight this process is meant to be iterative. And thank you for Subcommittee member comments in our previous June meeting.

We have a text the draft regulatory guide to highlight this aspect that the design process and the development of licensing basis information is meant to be iterative. When you -- involves assessment and decisions of system design, operating parameters, programmatic control.

So the identification of initiating events and event sequences is expected to be performed as the designer goes through the conceptual phases. And as the design matures, the licensee or applicant should consider the licensing framework it is planning to use. Because as I mentioned before, this decision influences the process for identifying licensing events.

Now, go on to the flow chart. You've seen this flow chart before, but since the last meeting, we moved a couple boxes. But generally the same idea of the flow chart remains. Changes we've made are marked on this flow chart in this transparent caption boxes.

So I'm going to briefly review the process. So again, process starts with box 1, assemble the team. So we -- to conduct an identification licensing event, we believe that it's necessary a multi-disciplinary team with the right expertise.

And we listed a number of disciplines that we believe that need to be part of the team. So of course licensing of plan design, thermohydraulics, PRA, even expertise in selected metal analyses, etc.

Box 2, establish a control -- quality control program. And this is a new explicit step we added in response to the informal subcommittee member comments. We added an explicit guidance and step on establishing a quality control program prior to engaging in the work. And I will discuss this in a lot more detail in the following slides.

Then we move in the next boxes to collecting application-specific information. Most yellow boxes at the top. In Box 3, we'll collect all the plant-specific information and site characteristics. In Box 4, identify all radiological sources and transfer barriers from the source and the environment.

In Box 6, include explicit search for sources of hazard chemical materials, which may be none, similarly to searching for the radiological sources. This, as a refresher, we are thinking of those chemical hazards that are combined with the radiological hazards, which can impact a plan response initiating event or may affect the properties of the radiological release.

And also want to mention other hazards. If there's hazards from nearby industrial facilities, that could induce an initiative event to the nuclear plant. I'd expect that to be covered during search for initiating events. And we updated a text on that section as well.

Then on Box 6, we'll proceed to the identification of those previously defined safety function and identify assistance needed to perform the safety function. We appreciate ACRS member comments on previous texts and we updated the draft guide to better reflect progress on safety function.

But the key highlight here I want to mention is that the definition of safety function is expected to be performed during the design stage. And here in this guide we assume that those safety function have been already defined. And with the

definition and identification, one can proceed to identifying initiating events.

In Box 7, we identified end states for event sequences which will be used to support event sequence delineation selection.

So now moving to the bottom of the slide, in -- we aligned the selection of the analysis methods in Box 8. Selecting methods or techniques for identification initiating events. This is the key, selecting the methods is the key for conducting the search that is systematic, comprehensive, and without preconception or reliance on predefined risk.

So refresher that we think this search needs to start with a blank sheet of paper to ensure that the plant design is appropriate, analyze and demonstrate it to be safe. The techniques --

MR. BLEY: Can I interrupt you here?

MS. BIRO: Yes, please.

MR. BLEY: This is just a point of argument for me, but to me what you're talking through right now on the systematic and comprehensive search for initiating events is what provides assurance that the set is sufficient.

The QA program, I don't know how it does that. It seems inside out. The QA program is kind of

an overview to make sure that you're following process. But this search for the initiating events is really the thing that provides assurance that we have a good set.

MS. BIRO: Okay. So are you -- are you commenting on the colors, or I'm sorry, it's a good point. Yes, absolutely. That's the --

MR. BLEY: Yes, I am commenting on the colors. Now, you have more colors than are used in the Reg Guide, I think. Maybe not.

MS. BIRO: Yeah, I think we have them the same, but we can definitely take it back and think of that.

MR. BLEY: Anyway, to me, QA isn't the thing that makes sure we've got a good set. It's -- think about that when get to that.

MS. BIRO: Well, I mean, yeah, of course the work, doing the work correctly, it's important, right. And then the quality assurance is just assurance that another layer on top of it to ensure that the work is done correctly. So yes.

MR. BLEY: Go ahead.

MEMBER REMPE: So this -- Dennis, are you done?

MR. BLEY: I am.

MEMBER REMPE: This is Joy, and I appreciate your willingness and in a very positive way. So I'm almost embarrassed to be asking for me. But on Box No. 5 where you talk about co-located facilities and you say we're going to talk about this more in Items 26-29, and I, when I went to 26-29, I didn't see what I was hoping to see.

I think just a few more words to talk about other site-specific hazards that could adversely affect plant operations. And then adding something about like gas lines, a hydrogen production facility, a rail line. Just a few more items to give the applicant a bit more of an idea of the thoroughness expected would be helpful.

MS. BIRO: Thank you for your comment. We tried to capture that somehow based on the previous work that's been done. Just looking for hazards and initiating events, at least external to the plant have been the key in the PRA development over the many years.

So there are references, there are a lot of long list of items that have been compiled over the years. And we did provide a reference the latest PRA standard for non-light water reactors. And so it's endorsed in the reg guide.

So if you open that, it has like everything under the sun that can be considered. But if you feel like you would need more to highlight that importance, we can definitely add a sentence or two and then refer them --

MEMBER REMPE: Yeah, well like Box 10-12 says other hazards such as hazards from your bio-industrial facilities that could induce initiating events. And then it says hey, go look at 26 and -- paragraphs 26-29 below.

So that was where I expected it, but when I got to those paragraphs, it mainly focused on internal hazards like flooding and external hazards like seismic and high winds. I didn't see things that I wanted to see there. So I think some additional words would really help. But again, it's just one member's comment.

MS. BIRO: Okay --

MEMBER HALNON: So this is Greg, just to carry on the paragraph before that, number 11, it talks about the chemical sources that are outside the scope. Which is fine, it just kind of leaves me hanging.

Just, you might consider giving the nuclear designer a place that they can go look or at

least an agency that they would go look for guidance on chemical sources, given the fact that we don't know what kind of chemicals will be on some of these plants.

That's just a suggestion. The question I -- another question I have is in fact in the quality control program it talks about making sure that the PRA is peer-reviewed or has a self-assessment. The self-assessment guidance in 1.200 points back to an ISG for a DC or COL.

Is that what you intend to use for people to see that self-assessment or use the self-assessment guidance in that box or quality control program and the adequacy of PRA?

MS. BIRO: Marty, can you help? I'm not familiar with the COL, but I guess we have a, my last slide is covering with, you know, we have certain parts of this guide that we believe they should be subject to quality control. And then others to quality assurance.

And the parts that are being traditionally part of the PRA as the initiating event search and event sequences, those would be a quality control. And we would use existing programs such as those that are currently used for a PRA, which include a peer

review guidance and self-assessments.

MR. STUTZKE: Yeah, if can add to it, Greg. DC COL ISG 028 again applies to LWRs. So we're developing another guidance document that would apply to the non-LWRs.

MEMBER HALNON: Okay, I just wanted to make sure that we were not just relying on that one ISG.

MR. STUTZKE: Right.

MEMBER HALNON: And if you were, that it was going to get looked at.

MR. STUTZKE: Right.

MEMBER HALNON: Sounds like you got it, so thanks, Marty.

MS. BIRO: Thank you. Any other questions? Okay, so I'll continue on then.

So we were at Box 8, selecting the initiating event identification method. I want to mention that the Appendix A summarizes know and well-established techniques.

And we appreciate Dr. Bley's references and information on the system-level FMEA. And we did not get a chance to yet to update the appendix, but are planning to update it in the near future. Okay.

So then on Box 9, describe the strategy

for grouping initiating events, and in Box 10, consider any analytical methods for event sequence delineation, such as event trees that are well known to the PRA practitioners and similar event tree diagrams, which is a graphical tool similar to the event tree. Next slide, please.

So then the online process proceeds to identify in the list initiating events, applying the selected methods and grouping strategy. We already kind of covered this, that we've tried to add a little bit more detail on the initiating event analysis, listing that to include both internal hazards such as the internal flooding, fires, but also external hazards, seismic events, high winds, external floods, and other external hazards. And multiple reactor modules.

So then as I mentioned, we added a reference. There are many reference that provide us a list of external hazards. And so we reference Reg Guide 1.247 and the associated non-light water PRA standard, which provides a pretty comprehensive list which is compiled based on the review of previous references. But we'll take it back and see if we can enhance the text.

Then moving on, Box 13 includes a step for

reviewing any relevant operating experience, as well as any prior relevant initiating event analysis. Then similarly in Box 15 on the bottom of the page, apply the selected methods to analyze the plant response to initiating events to delineate event sequences.

So now I want to talk about Box 14 and 17 regarding the independent review and quality control. So in this guide we recommend a quality control of this work for initiating events and for event sequence selection, two items that are on this page of the flow chart.

Because they are not directly -- this work is not directly part of the design basis information. And so we don't think this should be subject to formal quality assurance. And this is a continuation of the current practice with those that develop a PRA. Next slide, please.

So finally, proceeding to the licensing events. If a PRA's developed, provide initiating events and event sequences to the PRA.

MR. BLEY: I'm sorry, can you go back to that last slide? I missed something reading. Right at the end here you were describing the search for initiating events and event sequences. Oh, okay, you're making the distinction between quality control

and quality assurance.

MS. BIRO: Yeah, and I have a slide on this. We'll clarify this.

MR. BLEY: Okay.

MS. BIRO: My last slide is going to cover just this aspect of quality assurance versus quality control and which parts are what.

MR. BLEY: Good, I need help with that.

MS. BIRO: Yeah, so I'm almost there, almost there, I promise. I got one more slide before that. Okay, so next slide, please.

So in Box 20, identify the required categories of licensing events for a selected licensing framework. If the LMP is being used, we just, we discussed currently only applies to non-light water reactors licensed under Parts 50 or 52. And in that case, we expect -- we direct to the use of Reg Guide 1.233 as the relevant guidance for the licensing event identification.

As I mentioned, we do intend to revise the guidance in 1.233 to address licensing under Part 53 Framework A in the future, but a flow chart reflect the current state of things as we -- as right now.

So now going down, for all other application, it will remain in scope of this draft

guide, 14-13. And we'll proceed to licensing event identification in Box 21. The designer applicants expected to define the strategy for grouping event sequences, which can be done by frequency or qualitatively or quantitatively or by type.

Then Box 22, apply licensing event grouping strategy. And then Box 23, identify the limiting cases for each group of licensing events.

In Box 24, we still have a step for comparison to predefined list. We added this because comparison with the standard review plan is required currently under Part 50 and 52 for light water reactors.

And then finally, in Box 25, independent review and quality assurance activities for the licensing event identification. So as you can see here, we are expected quality assurance, or formerly quality assurance program, as opposed to a previous slide, which is was just quality control.

So moving on the next slide, try to capture the differences here. So as we said in Step 2 at the beginning, it's expected to establish a quality control program prior to engaging in the work.

And now there are two parts to this, right. The initiating event and event sequence

analysis are not subject to the quality assurance requirements, the -- which is quality control, because a PRA is not part of design basis information.

And we do list several system programs that may be leveraged that we had over there for PRA configuration control and peer reviews.

And then finally, the other part --

MR. BLEY: I'm sorry to cut in again. If I'm reading your words correctly, the only in NRC's parlance that quality assurance applies to is design basis information? Is that definitional? I mean, there's -- the rest of the world about quality assurance in a somewhat different way, I think.

MS. BIRO: Okay, I guess we're kind of considering context of the NRC regulations here. I don't know.

MR. BLEY: So it sounds like it's definitional. Quality assurance is something that for the NRC is only applied to design basis information.

MS. BIRO: That's how we see it for this guide, yes.

MR. BLEY: Okay. I can't argue with a definition, but it's new to me.

MR. STUTZKE: Dennis, if I could, let me go back. There was a rulemaking on Part 52 back in

2007. And at that time, the staff determined that Tier 2 information -- or the PRA was not part of the Tier 2 information for a design certification.

And based on that, SRP Chapter 19.0 was revised to conclude that because the PRA is not part of the Tier 2 information, it's not subject to quality assurance requirements.

MR. BLEY: I didn't know or remember that. And it feels odd to me, but okay.

MR. STUTZKE: But when we use quality control, we're talking about the guidance that originally appeared in Reg Guide 1.174. Use qualified people, independent review, configuration control, and that thing.

MR. BLEY: Okay, so we're covered. It's just this definitional thing.

MR. STUTZKE: Right, it's just the boundary between the formal QA program and what we normally do for PRA.

MR. BLEY: I thought Chapter 19 was part of Tier 2. It's not?

MR. STUTZKE: No, that's the -- actually it's in ISG 28 and SRP 19, yeah.

MR. BLEY: Fair enough, okay.

MS. BIRO: Thank you, Marty. So that's

all I have. So again, the licensing event selection, it would be subject to quality assurance as opposed to the initiating event sequence analysis, which would be quality control.

That's all I have. If there are any questions? All right, then, I guess we can --

MR. BLEY: I guess I do have a question, and this is probably more for Bill. Are we consistent in this use of QA in the language that's in Part 53 and this guidance? I'd have to go back and look, I don't know. Is Bill still here?

MR. RECKLEY: Yeah, I'm still here. I think we are, Dennis, but let us go back and study that. But I think we are.

MR. BLEY: Okay.

MS. BIRO: All right, well, thank you for your time. I appreciate your time giving me a chance to present today, and I'm going to turn it over to Anne-Marie.

MS. GRADY: Next slide, please.

Good afternoon, I'm Anne-Marie Grady, a Reliability and Risk Analyst in the Office of Nuclear Reactor Regulation, Division of Risk Assessment.

And I'm going to discuss today with your DG-1414, the alternative evaluation for risk insights

methodology. I'll be focusing on the changes that we've made to DG-1414 since we presented to you last in June. And the additions that we've made and a little bit of emphasis. Next slide, please.

The alternative evaluation of risk insights methodology provides the guidance on the use of an AERI methodology to inform the content of applications and licensing basis for LWRs and non-LWRs. 10 CFR 50.4730(a)(34)(ii) establishes AERI as an alternative to a PRA for a risk evaluation if entry conditions A and B for the -- for an AERI are met.

The title of this draft guide is now AERI Methodology to distinguish it from Part 53 Frameworks A and B. The new title does not signal any change in approach.

In the green box below is a statement that was in the previous guide that you've already seen, but it bears repeating because it seems like it's understood by some people. And it states the following: applicants who meet the AERI entry conditions, they elect to develop an AERI in lieu of a PRA.

However, a PRA confers additional benefits such as a means to operate the design and the ability to take advantage of various risk-informed

initiatives, for example risk-informed completion times, risk-informed categorization of SSCs, etc. Next slide, please.

You didn't see this in the Subcommittee, this particular licensing pathways flow chart exactly as it is right here. You did see it for the full Committee.

And the differences in what you saw last in subcommittee is in -- under the AERI box, the various elements of the AERI are Q4 has been added, which assesses defense-in-depth adequacy by reviewing all of event sequences. Other than that, there is no change to what you have seen before in subcommittee. Next slide, please.

The elements of the AERI methodology. There are some changes. It applies to LWRs and non-LWRs under Part 53, Framework B. And the elements include identification and characterization of the postulated part -- the events.

MR. BLEY: Anne-Marie?

MS. GRADY: Yes.

MR. BLEY: I'm a slide behind you catching up with my brain here. This is Dennis.

MS. GRADY: Oh, I'm sorry.

MR. BLEY: You don't need to back up.

From my reading, and I think from what you just said, whether you do a PRA or AERI, you do the same search for initiating events and scenarios.

MS. GRADY: Yes.

MR. BLEY: Same thoroughness, okay. That's really essential, I think, but go ahead.

MS. GRADY: One part of the elements of how the AERI methodology and selection of licensing events, which has already been covered by Mihaela in DG 1413. It considers both core and non-core radiological sources. And the non-core radiological sources is a change that I'll discuss in a little bit further.

It performs a consequence analysis for the selected licensing events and multiple bounding events could be considered for events with approximately similar likelihoods of occurrence and similar overall radiological impacts with different radiological release characteristics.

The next element would be estimating dose consequence for the postulated bounding event to confirm the reactor design meets the AERI entry conditions. That is covered under Part 53.47(a)(34)(ii) Condition A.

Condition A is one that you have seen

before, and it talks about the dose at the consequences at 100 meters from a plant to not exceed one rem TEDE over the first four days following a release. An additional two rem TEDE in the first year. And a half a rem TEDE in the second and subsequent years. And those are conditions that have been discussed at length today and you've seen before in this draft guide.

Condition B has been added, as Marty alluded earlier, described earlier today. And it must be without, it says Condition B is now the Condition A must be met without reliance on active safety features or passive safety features, except passive safety features that don't require equipment actuation or operator action to perform their required safety functions that are expected to survive accident conditions.

And it cannot be made unavailable or otherwise defeated by credible human errors of commission or omission.

One acceptable approach to developing a dose consequence estimate is to provide the postulated bounding event source term to a program such as MACCS or a comparable analytical model.

MEMBER HALNON: Anne-Marie, this is Greg.

That bullet under Condition B just exemplifies the earlier comments we made about being able to define passive. And clearly the passive, if it required equipment actuation, wouldn't be considered passive. Or if it needed operator action, it wouldn't be considered passive.

So it's kind of talking past itself. I know Marty took a note, but just wanted to exemplify the earlier comment about defining what passive is.

MS. GRADY: Thank you, Greg. I heard your comment earlier today and I think we'll be revisiting that. Not changing it, but making sure that we've stated clearly what we mean.

MEMBER HALNON: Yeah, and consistency through the, you know, between the GLRO and this would be -- would be good, just to make sure that we're not adding confusion.

MS. GRADY: Yes, I'm making a note of that. Okay, next slide, please.

There is no change in the presentation on this slide of these elements of the methodology. It's to determine a demonstrably conservative risk estimate for the postulated bounding event to determine that the QHOs are met. And the elements are described in the draft guide and you've seen them before.

Utilizing the consequence estimate, the sooner frequency of once a year.

Compared to the QHOs, the applicant may use a different frequency than once a year with justification, which the staff will review on a case-by-case basis. And the applicant should identify any software codes used for consequence analyses and provide information on how the development and maintenance of these codes meets quality standards commensurate with the application. Next slide, please.

Okay, what is here that has changed is the definition of severe accidents. And this is the definition that is applicable to Framework B under Part 53. And it's specific to that. And the search for severe accident vulnerabilities involves severe accidents obviously.

Severe accidents are those events that progress beyond DBAs in which substantial damage is done to the reactor core and that -- or to any other structure, vessel, or retention system containing a significant inventory of radiological material, whether or not there are serious offsite consequences.

Now, that -- the definition that I just read to you is a definition that we've had for

decades, except for the part of the non-core source term. And that's been added -- excuse me -- that's been added for this AERI methodology. And it's to make it technology-inclusive.

MEMBER HALNON: So Anne-Marie, is this the same definition of severe accident that's in the front of Framework B in the definition section?

MS. GRADY: Yes, in 53.028.

MEMBER HALNON: Okay, because when I was discussing this with Travis, and it was probably the wording on the slide, it struck me as not. This is -- this is a good definition. I don't have some of the same issues with it. So it probably was just the way it was on the slide. Thank you.

MS. GRADY: I'm sorry, okay. The search for severe accident vulnerabilities are aspects of a design which represent an over-reliance on a single design feature, either for accident prevention or mitigation that could lead to a severe accident. It encompasses the entire set of licensing events and any additional severe accidents. Searches for cliff edge effects it considers external hazards.

The search for severe accident vulnerabilities addresses how identifying severe accident vulnerabilities could enable a design to

prevent or mitigate severe accidents.

And if in the course of the reactor plant design, if a severe accident vulnerability could not be designed out or was chosen, elected not to be designed out, then the applicant, to meet the -- to meet the AERI methodology would need to justify why the vulnerability was left in the design and why it's acceptable for the design. Next slide, please.

The last slide on the elements of AERI methodology includes the identification of risk insights, the objective of which is to understand the issues that are important to plant operation and safety, such as important hazards and initiators, important event sequences and their associated SSC failures and human error, system interactions, vulnerable plant areas, likely outcomes, sensitivities, and areas of uncertainty.

The search encompasses the entire set of licensing events. It provides an understanding of the hierarchy of events ranked by frequency. And the assessment for this, and the next bullet is the one that was added since you've last seen this description of the AERI methodology, is the assessment of defense-in-depth adequacy, which encompasses the entire set of previously identified licensing events.

And the facility design should include a reasonable balance among the layers of defense to ensure that failure of a single barrier does not result in a severe accident.

MR. BLEY: Anne-Marie

MS. GRADY: Yes.

MR. BLEY: This is another definitional question. I liked the last bullet, but is layers of defense, I mean, that's used in Europe a lot, but I -- is that a defined phrase in NRC speak?

MS. GRADY: I don't know the answer to that. I am familiar with it in the IAEA documents.

MR. BLEY: Yeah, that's where I've seen it too. And I've kind of liked what they did. I've seen -- I've encountered folks at NRC in the past who didn't like that approach at all. Anyway, I just wondered if layers of defense has a fixed meaning.

MS. GRADY: Layers of defense are not defined in this draft guide for sure. And I don't know where I would find it if I were looking for it. Maybe Marty knows, but I don't.

MR. BLEY: Okay, but it's something that maybe ought to be clarified. I don't know if it can cause confusion or not. It doesn't bother me, but I could see it maybe being a problem.

MEMBER HALNON: This is Greg, just one thing I wanted to highlight, and maybe you can tell me if I'm wrong. When you do the assessment of defense-in-depth, I mean, we've already eliminated any operator action from this assessment, correct?

I mean, is that -- because the operator is like a real important aspect of defense-in-depth that we talk about today. But here we've eliminated that operator action from being considered. Is that correct?

MS. GRADY: Yes.

MEMBER HALNON: Okay.

MR. BLEY: So even errors of so-called errors of commission, which could create situations nobody thought about.

MEMBER HALNON: Yeah, that's a question that I was going to follow up with.

MR. BLEY: Oh, I'm sorry.

MEMBER HALNON: I mean, you're absolutely right, Dennis. Throughout this credited human actions, and the questions would be, well, what about uncredited human actions.

And I think part of the assessment of its -- I mean, the entry criteria eliminates those as well, because it talks about -- I think this is the

area that it talks about. Or is that in the -- see, I get them mixed up now, GLRO, the license operator of this one.

MR. BLEY: I think it's in here, but.

MEMBER HALNON: Yeah, I think it illuminates that errors of commission and omission in the entry criteria so that --

MR. BLEY: There's a bit of a problem with that, and that is I don't know of any, I'll call it approved, NRC guidance that gives people guidance on how to search for those errors of commission, things we didn't expect the operators to do.

I sat in on a meeting, God, it's probably been 30 years ago, with a passive design group of folks. And nothing could happen to that reactor, but I saw a couple dials and said, well, what if the operators closes those, you could get into a pretty bad state. And their response was well, nobody would ever close those. And you know, that kind of stuff happens.

The Athena guidance gave one way to look to try to search for errors of, so-called errors of commission. But I -- maybe somebody on the staff can tell us how they're going to gain confidence that there are no errors of commission that could cause a

problem.

MR. SEYMOUR: So if I -- if I could just make a point here, again, sorry to interject. This is Jesse Seymour from the Operator Licensing and Human Factors Branch.

One thing that I wanted to kind of harken back to we talked about earlier was how the, you know, the AERI criteria, you know, pointed to inherent characteristics and passive safety features of, you know, what I referred to in passing as a robust -- of a robust nature. And the reason for that, the basis for that, gets right to the heart of this issue, right.

How do you go through and how do you, you know, address the potential not only for errors of commission, but also errors of omission, right. So either folks going through and doing things that they shouldn't do or failing to do things that they should, right.

So in terms of someone not taking a mitigative action, that's a little bit, you know, easier to go through and to assess. In the case of an error of commission, someone, you know, taking some type of inappropriate act, that's a much wider range of things, right.

And so the types of things that were on our mind as we consider that were what happens if someone goes through and you know, leaves a valve out of position during maintenance, right. Or if they go through and they, you know, leave a train of reactor protections, you know, in a deactivated state, right, inhibited or whatnot.

And so as we went through, what we found was that you know, the complexity of that issue was such that if you instead looked at the types of safety features that could be used and you limited those to things that were would be generally resistant to the influence of those types of errors, right, so things of -- you know, and I've used the terms robust, passive, and inherent.

But you know, to make it tangible the types of things that we're talking about are, you know, concrete, steel, you know, advanced types of fuels, right, you know, heat pipes, right. These types of things that don't have, you know, valves that move and you know, components that actually so on and so forth. Or even necessarily reliance on stored energy.

And if you use those types of, you know, mechanisms, then you're going to be hard-pressed to

have human errors that are going to be able to influence their function on these types of conditions, right.

And so when we're dealing with AERI, one of the things that we don't have is we don't have, you know, the PRA approach that would go through and that would really dig into, you know, the complexities of active systems and so forth.

So another layer to what we had to do here is to say in the absence of that type of approach, what is it that we're willing to credit if we're not going to go through and quantify, you know, the function of those active features and also, you know, the human interaction with them.

So again, I just wanted to put those points out there, you know, again, just kind of jumping in a bit with some of what we'll talk about tomorrow as well.

MR. BLEY: Yeah, well, given the right design, as you were saying, it gets much easier to show there's nothing anybody can do to cause a problem. But we don't know what designs will come in and try to come in under AERI.

So if there are human actions that can get us in trouble, they may be harder to search for. If

the systems are simple enough, maybe, maybe not. Maybe it's easy.

CHAIR PETTI: I thought I'd let folks know someone posted in the chat, which we're not supposed to do, but the glossary, the definition of defense-in-depth in the NRC glossary has the terms the layer of defense in their definition.

MEMBER HALNON: It has emergency response actions too, so if that's the -- what we're eliminating in this, what we're talking about. So anyway, that's a key portion of defense-in-depth, and I think we just have to change our mindset a little bit because we've seemingly eliminated the human portion of this earlier on by getting to this point.

MS. GRADY: Largely, the plants that are going to be able to avail themselves of the AERI methodology are hopefully very simple plants. And there's not a lot of complexity that we seem to be thinking of as examples.

MEMBER HALNON: I agree, Anne-Marie, but it's very difficult for an operator to put their hands in their pockets and just watch something happen.

MS. GRADY: Yes.

MEMBER HALNON: So that's the point Dennis is trying to make I think.

MS. GRADY: Okay, so would you like some elaboration on this further in the draft guide, is that what you're saying?

MEMBER HALNON: Not necessarily. I mean, I think that it's something to think about. I think it goes back to the passive discussion to some extent. And you know, you've got it clearly covered in the entry criteria.

I think the difference is that we have to change at this point. When we say here defense-in-depth, we've to change the paradigm in our mind that there is no human action permitted to be talked about.

I mean, we talked about credited human action with the license events. But there's a lot of human actions that aren't credited that could either help or hinder the response of the plant.

And those need to be looked at as well. And you sort of have it up front, but I think it just needs to be kept in mind as we go through defense-in-depth, because it is a pretty broad terms that includes human actions.

MS. GRADY: Thank you. Any other questions? Next slide, please. Could we see the next slide, please? How about the previous one? Thank you, thank you.

Okay, the next two slides are new since we spoke about Draft Guide 1414 back in June, when we had promised you that we would address maintaining and operating the AERI risk evaluation. And the material is in the draft guide. And I'm going to summarize it here.

And on this slide, the slide one of two, the steps that are going to be recommended are required are to assure that the risk evaluation continue to be useful, valid, and an adequate basis for regulatory decisionmaking throughout the plant lifetime.

The initial risk evaluation must be performed by the scheduled fuel log date. The risk evaluation should be maintained or upgraded every five years. The -- we -- also required is to regularly assess that the postulating bounding event selection remains current. If it's not, we need -- the applicant needs to identify a new postulated bounding event to be used in an upgraded risk evaluation.

The as-built, as-operated facility needs to be reflected in the -- or an operational scheme needs to be reflected since if it's been changed since the prior risk evaluation. And if it has, then risk evaluation needs to be maintained or upgraded.

If any new safety issues have arisen, then it needs to be ascertained that the new safety issues that have arisen since the prior risk evaluation, that the risk evaluation would be maintained or upgraded to reflect the new safety issues.

Likewise, if new data, information, or analyses become available, they need -- the applicant needs to ascertain if any relevant new data, information, or analyses have arisen since the prior risk evaluation. And if so, to maintain or upgrade the risk evaluation.

Now, I need to -- I need to explain a distinction between this slide, which is current and worded carefully to reflect either that the risk evaluation needs to be maintained and/or upgraded, because the draft guide language right now in Part -- in Section C in the draft guidance is lagging in this current wording.

And in the draft guide, the wording where we have maintaining or upgrade, we have updated. And that's going to be changed at the next opportunity to change the draft guide so that the draft guide will conform to what you see on this slide 98. So maintained and upgraded are the proper terms, the ones that we've relied on and will continue to rely on.

The draft guide will be updated. And that applies to Sections C 7.2, 7.3, an 7.4. Updated is -- will be revised.

MEMBER HALNON: Anne-Marie, this is Greg. Thanks, that is a curious question. But also is the five years expected to be or intended to be a backstop in that if there's any significant change, that they should be upgraded in real time? Or is it just keep a list of all the stuff and upgrade it every five years?

MS. GRADY: I don't -- the draft guide is not specific, to answer your question. I assumed it was going to be keep track of it and maintain it or upgrade it every five years. But if somebody knows more than I do, then I appreciate any insight they might have.

MR. BLEY: This is Dennis. Somebody early today, one of the first presentations, and it might have been Bill, I'm not sure, who first described this language change, and it's nice to have fixed language. I thought, like the PRA, it's updated periodically. And I thought he said this, unless there's a change. And then at that point, you have to upgrade it immediately.

Somebody said that, and the reg guide

should be fixed to be specific to make that clear.

I don't know, Bill, was that you or somebody else talking about this upgrade language? I remember the slide.

MR. STUTZKE: Yeah, Dennis, this is Marty. I talked about it earlier. And I will go back and see what the rule text actually says.

MR. BLEY: Okay, because I think, it must have been your presentation. I think when you said it, at least the impression I got was you upgrade either at the fixed time interval or if there's a significant change to something that might affect the rest of the plant.

MEMBER HALNON: And that's what I was hoping. That's what I'd expect, I thought the five years would just be a backstop to make sure that it's -- it's current.

MR. BLEY: Yeah, and yeah, to accumulate changes like they collected date and this sort of thing, yeah. So it ought to say that, and we probably ought to consider that in our response to this.

MEMBER HALNON: Yeah, I agree.

MR. BLEY: That would be a good one to bring up at the full Committee, by the way, and clarify that point.

MS. GRADY: Yes, we will check the rule language and we will bring -- we will address it at the full Committee meeting.

MEMBER BIER: Hi, another question, this is Vicki Bier. First of all, thank you, Dennis, for raising that point. Also, I may have kind of missed some details on this earlier in the day, but what is the distinction of what would require an upgrade rather than just maintenance like repeating the analysis with more up-to-date data?

MS. GRADY: If it would change the risk evaluation, the consequences of the evaluation. If the new information would change the results.

MEMBER BIER: I guess I'm wondering is it just sort of new plant information, like we discovered a new scenario that wasn't in our original analysis? You know, kind of a Browns Ferry type situation?

Or whether it's also, you know, kind of updated methodology that, you know, other plants have been doing more sophisticated AERIs or the NRC has changed the guidance on AERI so now you have to do a little more than you had to five years ago.

MS. GRADY: I don't know if you're suggesting that the conditions for the risk evaluation should be changed once somebody has met the entry

conditions. I think they just have to keep them maintained or upgraded. I don't think -- I don't think new requirements can be imposed, I guess is what I'm saying.

MEMBER BIER: Got it. Okay, yeah, I think I'm just stumbling over the concept of upgrade, the term upgrade. Because I kind of feel like, you know, gee, upgrade kind of talks about new methodologies. They're a better method for doing this now. But it doesn't sound like that's what is meant by it in this context, so that's fine. Yes, thank you.

MS. GRADY: You're welcome. Next slide, please.

MEMBER DIMITRIJEVIC: Anne-Marie, hi, this is Vesna. I just have to point out that here we are talking about ultimately the evaluation of risk, you cite risk evaluation, so. You know, this risk evaluation doesn't go with AERI, so it's just we have to keep in mind what we are talking in AERI. We're already talking about evaluation of risk is just alternative.

It's just my comment on the language, that we have repetition. Maybe this -- you should you call every approach ultimate risk assessment, ARA or something, risk evaluation. But here you already have

evaluation of risk in AERI.

MS. GRADY: Vesna, I'm sorry, I'm not following your point.

MEMBER DIMITRIJEVIC: Okay, then main AERI already has risk evaluation.

MS. GRADY: Yes.

MEMBER DIMITRIJEVIC: So they just say -- so basically what you are saying ultimate evaluation of risk inside risk evaluation. That doesn't make sense. That's what I'm saying, so.

Because if that will be equivalent if I say PRA, you know, risk assessment, because risk assessment is already part of PRA, you know, what I mean? It's the way how it's phrased, it's duplicate of the aggravation and the roles.

MS. GRADY: Thank you. Marty.

MR. STUTZKE: In the, I agree, the title of the slide is a little awkward. In the rule text, we require applicants to perform a risk evaluation, which is either a PRA or this AERI, the alternative evaluation for risk insights. In other words, both AERI and PRA are types of risk evaluations.

MEMBER DIMITRIJEVIC: Okay. I mean, this is like, because basically your AERI is just alternative to PRA. Simplified PRA or whatever,

something which is not cumulative about the event. So I mean, I just want to say the way how, you know, then maybe you shouldn't have a risk evaluation in the -- all right.

Just picking on the -- that's okay. Whatever you have, you already developed, so it is best.

MS. GRADY: Thank you for your comment. Next slide, please. Okay. Moving on to maintaining and upgrade the AERI. The QHO comparison, if the AERI risk evaluation requires upgrading, the QHO comparison should be revisited and modified if appropriate.

Likewise, for the vulnerability search, if the risk evaluation requires upgrading the severe accident vulnerability search should be revisited and modified if appropriate.

For the search of risk insights, if the risk evaluation requires upgrading, the search for risk insights should be revisited and modified if appropriate. And likewise on the defense-in-depth, if the risk evaluation requires upgrading, the defense-in-depth should be -- evaluation should be revisited and modified, if appropriate.

And as I mentioned on the previous slide, the slide itself, this slide is current, the language

is current. The language requiring upgrading and revisiting and modifying are all current. The language in the draft guide is lagging.

And where it says upgraded on slide, it says updated in the draft guide. We are going to revise that to conform the draft guide to this slide. And the affects in Section C of the draft guide Sections 7.5, 7.6, 7.7, and 7.8.

That's all I have. If anybody has any further questions or comments.

MEMBER REMPE: Hi, this is Joy. I was looking through the updated draft guide, the fact that it emphasizes if you don't have an essentially complete design you may have trouble going through AERI caught my eye. And it was actually in the earlier version.

But I'm just wondering if that point has been sufficiently emphasized in your interactions with other stakeholders so everybody understands this. Because I mean, that was one of their complaints, that it was hard to do a PRA for these simple designs. But I'm also wondering if it's also a lack of completeness in their design methodology.

Any thoughts on that topic?

MS. GRADY: We have a meeting with -- in

meetings with stakeholders emphasized the fact that they may want to avail themselves of the AERI approach.

And it may be early in their design phase, which probably means that it's going to be kind of an iterative process for them. Because eventually once their design has reached some sort of mature stage, they'll have establish that they meet the entry conditions.

So we have emphasized it's iterative in our discussions with stakeholders, yes.

MEMBER REMPE: Okay, thank you.

MS. GRADY: You're welcome.

MEMBER HALNON: Members, any other comments? Well, thank you, Anne-Marie. With that, we have covered everything that we had planned to cover today. And we will be back at it, same time, same place, tomorrow to continue.

I just want to reflect there's a lot of information here. The presentations were really helpful. As I think about having to wade through the 2000 pages last week, it would have been nice to have had the slides ahead of that. It would have helped me focus.

But does anyone want to have any broad

discussion? Or we can obviously wait until tomorrow when we've finished the rest of the topics.

I think we're on the down side of diminishing marginal returns here then. So why don't we recess today, and we'll see everybody again at 8:30 tomorrow morning. Thank you.

(Whereupon, the above-entitled matter went off the record at 4:15 p.m.)

Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

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Location: teleconference

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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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REGULATORY RULEMAKING, POLICIES AND PRACTICES:

PART 53 SUBCOMMITTEE

+ + + + +

WEDNESDAY

OCTOBER 19, 2022

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The Subcommittee met via Video Teleconference, at 8:30 a.m. EDT, David Petti, Chairman, presiding.

COMMITTEE MEMBERS:

DAVID PETTI, Chair

RONALD G. BALLINGER, Member

VICKI BIER, Member

CHARLES H. BROWN, JR., Member

VESNA DIMITRIJEVIC, Member

GREGORY HALNON, Member

JOSE MARCH-LEUBA, Member

JOY L. REMPE, Member

MATTHEW SUNSERI, Member

ACRS CONSULTANT:

DENNIS BLEY

STEPHEN SCHULTZ

DESIGNATED FEDERAL OFFICIAL:

DEREK WIDMAYER

ALSO PRESENT:

BOB BEALL, NMSS

MIHAELA BIRO, NRR

KEITH COMPTON, RES

DAVID DESAULNIERS, NRR

CYRIL DRAFFIN, Public Participant

ROBERT FORTNER, Public Participant

RANI FRANOVICH, Public Participant

ANNE-MARIE GRADY, NRR

NIAV HUGHES GREEN, RES

JORDAN HOELLMAN, NRR

WILLIAM JESSUP, NRR

CONNIE KLINE, Public Participant

HILARY LANE, Public Participant

STEPHANIE MORROW, OEDO

LAUREN NIST, NRR

WILLIAM RECKLEY, NRR

AARON SANDERS, NMSS

MAURIN SCHEETZ, NRR

JOHN SEGALA, NRR

JESSE SEYMOUR, NRR

MOHAMED SHAMS, NRR

MARTIN STUTZKE, NRR

BOYCE TRAVIS, NRR

KATIE WAGNER, NRR

KALENE WALKER, Public Participant

JIM XU, RES

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P R O C E E D I N G S

8:30 a.m.

CHAIR PETTI: Good morning, everyone. Welcome back to Day Two of our discussions on Part 53.

For the benefit of the court reporter I'll just go through who I see online, we have Member Brown, Consultant Bley, Member Halnon, Member March-Leuba, Member Rempe, Member Sunseri, Member Ballinger, Consultant Schultz, Member Dimitrijevic, and Member Bier. So we have everybody we had yesterday.

With that I'll just turn it over to the staff to continue following the agenda.

MR. GREEN: Hi, good morning. This is Brian Green. I think we still have one member who's still trying to get into the meeting, so let me just confirm, Maurin, have you made it in yet? This she was having trouble with one of the links --

(Simultaneous speaking.)

MR. SCHEETZ: No, I'm in. I think Theresa was just joining, I think we got Theresa in now, too, so we're good.

MR. GREEN: Okay, great, we'll get started.

Thank you. My name's Brian Green, I'm the Human Factors Team Lead for NRR. I worked -- previous

to joining the NRC 12 years ago I got my PhD in industrial engineering and human factors at the University of Buffalo, where I studied trust of automation and different human factors aspects related to the aviation industry.

Today I'm going to be bringing the Human Factors team to discuss some of the aspects of Part 53, about how operator licensing and human factors will be treated under there, as well as the key guidance that we have.

Just like to start with a few opening remarks and then I'll go through an agenda, and introduce the rest of the team.

Throughout the history of nuclear power the nuclear power plant operator has been considered, often assumed, and sometimes taken for granted as a last line of defense. When active systems like pumps fail, it's expected that the operators will recognize the condition and take appropriate actions to ensure safety.

The NRC has taken an active role in ensuring that operators are capable of completing such actions by verifying their qualifications through operator licensing program, and ensuring the operators have the correct displays, controls, alarms and other

tools necessary to complete important tasks, by conducting human factors license reviews.

It is true that we have always relied on the operator as the last line of defense, however it may not always have to be that way. Small source terms, inherent safety features and other design features have already decreased the role that the operator plays in ensuring safety. This trend is likely to continue into the foreseeable future.

Recently NEIMA challenged the to create a regulation that is technology-inclusive, risk-informed, and performance based. Therefore, the staff drafted Part 53 which proposes certain regulations that allow for more flexibility of operation, training, and human system interface design for facilities that have a strong safety case that operator action is in fact not necessary to ensure safety.

For designs that continue to rely on operator actions to safely manage emergencies under abnormal events, the requirements are scaled appropriately.

Skeptics of what we proposed in the draft rule language may believe that it is appropriate to maintain the high standards currently used for

operator licensing and human factors design. Maintaining these high standards would certainly help ensure safety, we know this because the existing rules have been in place for decades and they've served us well in that time.

However, maintaining these high standards comes with a significant financial cost. It is expensive for utilities to develop and maintain operator licensing programs under Part 55, and it is expensive to implement a human factors design process like the one described in NUREG-0711 which is currently used with Part 50 and Part 52 licensees.

While these costs are justified with large facilities, they may be impediments to innovation for smaller designs. In some cases these costs may not be necessary or justified to provide a reasonable assurance of safety, especially for the smaller designs. Therefore, the staff proposed a series of gatekeeping elements in the draft rule to help ensure that these designs have robust inherent designs with demonstrated lower consequences are not subject to overly burdensome regulatory requirements.

Previously the human factors and operator licensing staff presented draft rule language to this committee, the industry, and to the public on numerous

occasions. The rulemaking language is written at a high level and many of the details that the staff had considered were not included in that language, because it was reserved for key support-guidance documents where this level of information is more generally preferred.

On September 30 the staff released the first draft of several key guidance documents associated with the human factor and operator licensing programs.

The staff and I believe that this guidance, when paired with the draft rule language, will provide a flexible framework that is consistent with the congressional mandate described in NEIMA to be risk-informed, performance-based, and technology inclusive. While still relying, to the degree necessary, on various regulatory mechanisms, like human factors licensing design reviews, operator licensing principles that are scaled to appropriate levels, based on risk associated with the specific design characteristics.

The staff welcomes any feedback that this committee provides that will help ensure that we meet the mandates in NEIMA, while still providing a reasonable assurance of safety.

And I'd like to quickly run through our agenda and introduce the team. Next slide, please.

So we've just gone through our introduction here, we're going to go through the updates to Subpart F and P since the second iteration. And then we're going to go through a quick summary -- well, I guess how quick it will be, I think we've got four hours to go through it -- but we are going to go through overviews of several ISG documents for operator licensing program reviews, staffing plan reviews, and a scalable human factors engineering review plan. And of course, we'll have plenty of time for questions. Next slide, please.

I'd like to thank many of the staff that are here to support us today, including Theresa Buchanan who will be speaking, Dr. Dave Desaulniers, Dr. Niav Hughes Green, Dr. Stephanie Morrow, Lauren Nist our Branch Chief, Maurin Scheetz, and Jesse Seymour. All of which have played a key role in developing the rule -- the draft guidance that you'll be discussing, and there have been several others who have contributed to this effort as well.

Now I'd like to turn the presentation over to Jesse Seymour. Jessie?

MR. SEYMOUR: Yes, thank you, Brian, I

appreciate it.

So, my name is Jesse Seymour and I am an operator licensing examiner and human factors technical reviewer in the Office of Nuclear Reactor Regulation.

And I will be discussing several items before we get into this morning's detailed discussion of our key guidance documents that cover the areas of the operator licensing program, staffing plan, and human factors engineering reviews under Part 53.

Specifically I'll be highlighting certain changes that have been made to the preliminary Part 53 rule language since the last presentation that we made to this committee, some of which were in direct response to points raised by the committee members.

I'll also be discussing the present status of our approach within the areas of engineering expertise and generally licensed reactor operators, as well.

Lastly, I'll also discuss the related portion of the staff's latest letter response to the committee and how these considerations informed our portion of that response.

To begin with, a significant change since our last presentation -- actually, I'm sorry, can we

move on to the next time, please? I just realized the slides had advanced, thank you.

To begin with, a significant change since our last presentation is that all of the operations phase requirements from human factors engineering, staffing, operator licensing, and training have now been consolidated under Subpart F.

For its part, Subpart P now just contains a single pointer that is located at 53.4220 to indicate the dual applicability of Subpart F's single set of requirements for these areas within both frameworks.

This approach was used in conjunction with some limited modification to Subpart F's wording to allow for those requirements to apply to both frameworks, A and B. In this way we've been able to substantially reduce the overall quantity of rule language needed to cover the full scope of Part 53's requirements for operations.

Additionally, in response to a request from stakeholders to provide a specific name for the class facilities that would utilize generally licensed reactor operators, we've defined the class of reactors meeting those technical requirements under the new term of self-reliant mitigation facilities.

This term reflects that a primary characteristic of these facilities is that they are not dependent on operator interaction in the mitigation of events, and as a result can be viewed as relying upon the characteristics of their own design in that regard.

Another area where we have sought to simplify our requirements has also been within the area of programmatic requirements for procedure management.

Based upon a careful review of other related requirements within Part 53, we determined that our separate requirement located under 53.730(e) was duplicative and could be consolidated without leaving any gaps in the regulatory treatment of these programs.

With regards to facility staffing plan requirements of 53.730(f), we modified the nature of the description provided for non-operations personnel such that greater emphasis will now be placed on describing how support functions like maintenance, fire protection and radiation protection will be accounted for under the proposed staffing plan. Instead of the focus being on defining the numbers of staff within various support roles.

The intent here is to be able to gain the same insights about what support is provided to operators, as well as what additional responsibilities might compound the operator's workload, without necessarily locking a future licensee into unwarranted license amendments to modify the number of individuals, like maintenance staff, later on once the staffing plan has undergone its initial approval.

Separate from these areas, we've updated our requirements for operator licensing examination programs to explicitly require that such programs provide for exams to possess the fundamental testing attributes of being both, valid and reliable. This update is interrelated with the operator licensing program guidance that will be discussed in the next portion of the presentation.

And these concepts of validity and reliability in exams factor centrally into that approach.

A further enhancement to the rule language within the area of operator licensing is that remedial training is now explicitly mandated for operators who do not pass their periodic continuing training examinations.

Lastly, within the context of the training

and examination programs for licensed operators, a change has been made such that commission approval is no longer required for simulation facilities. Instead, an approach comparable to that currently utilized for plant reference simulators would be utilized exclusively instead. Under which the suitability of stimulation facilities would be determined the via inspection by the staff.

It is anticipated that this will allow for a more efficient process for new simulation facilities being placed into service. Next slide, please.

MR. BLEY: Jesse, this is Dennis Bley. Are you going to talk more about that last bullet?

MR. SEYMOUR: I don't have another, you know, slide that comes back around to it. So we can certainly talk more about it now.

MR. BLEY: Yeah, if you could go over it again I'd appreciate it, and I guess I'm not completely familiar with the commission approval process for current large reactors. Say a little more about this if you can, explain it.

MR. SEYMOUR: Sure, I'll start out and, you know, Maurin, you know, if you have insights as well, too, that you'd like to share please, you know, feel free to add on.

But currently, under, you know, the existing simulator regulations, you know, so again 55.46, there are two tracks by which you can get a simulator essentially, you know, able to be used, you know, from a regulatory standpoint.

And one is to use a plant reference simulator and the other is commission approval, right? Now, commission approval, you know, is a little bit different in that it leaves alternatives to the use of a full-scope plant reference simulator. So, again, it is something that could be used to address a wider variety of approaches.

However, as we went back and we looked through this approach what we found was that we could leverage the same, you know, type of approach that's currently used to review plant reference simulators, and consider a wider variety of technologies without necessarily having to go through that, you know, administrative step of commission approval.

So, again, you know, the simplification here is that, under a plant reference simulator approach, we wouldn't be going through and doing, you know, a review and approval, you know, of the simulator in a way that -- actually, let me re-phrase that. We wouldn't be going through and, you know,

doing this, you know, commission approval process in necessarily the same structured way.

What it would do is let us come in and, using an inspection procedure, inspect the facility that was intended to be used and then go ahead and, you know, allow it to be used within that context.

So, again, it's a mechanism -- and by that I mean, commission approval is a mechanism that's really there to allow for alternatives, you know, to a full-scope plant reference simulator. And, really, what we would be doing is taking that plant referenced type of structured approach and just allowing it to be used for a wider variety of simulation facilities.

Maurin, did you have anything that you felt that you could, you know, add onto that?

MR. SCHEETZ: I actually don't, Jesse. And I thought Theresa covered this a little bit in her ISG, I wasn't sure.

MS. BUCHANAN: I think there is a slide related to that section, there's a section on simulators in the operator licensing ISG, Jesse.

MR. SEYMOUR: Okay. Yeah, so we will circle around a little bit.

MR. BLEY: That helps me a bit, thank you.

MEMBER BIER: Another interruption, this

is Vicki Bier. I don't want to get us too off track before getting into the detailed discussions, obviously, but I have a little bit of concern with some of the language. Both, with what you said about self-reliant mitigation facilities and with Brian's comment that we are no longer relying on humans as the last line of defense.

And, you know, I understand that, yes, there may be circumstances with the safety case doesn't depend on human involvement and where, for whatever reason, inherently safe features, or a small source term, or whatever we feel comfortable going with, a lesser level of requirements for human operators.

But I think the language that says that we don't need to rely on humans maybe sets a little bit of a wrong expectation, because in a number of these cases I think the technology, whether the reactor design or the software design -- if it's an automated safety actions -- is not necessarily going to be mature at the beginning of licensing.

And, you know, I was just talking about this with a colleague of mine about, you know, what is and isn't mature in automation. And you can think of a car as being automation but it's at a mature level

where I can set out driving from, you know, D.C. to California and I don't need to bring a mechanic or, you know, plan for stops along the way for upgrades or whatever.

But that's because we have, you know, a century of design experience and improvement, and, you know, if you think about even just, for example, the Browns Ferry fire, you know, we had learning along the way of what was needed to achieve safety for our current fleet.

And so, it's one thing I think to say that we don't anticipate that human involvement would be needed, but I think it's still helpful to keep a mindset that, even though we aren't anticipating that human role, humans may still be the last line of defense. Even, for example, if it is not an operator based at the site, but somebody brought in, you know, in an unanticipated type of emergency.

So there's just that caution from my side about let's not put too many assumptions in the language. It's one thing to say that, you know, we think we can have a lesser reliance on humans, but not think that humans are out of the loop. Because there could still be unanticipated occurrences where we turn out to need humans, even though we didn't think we

would.

So that's my comment.

MEMBER BROWN: This is Charles Brown --

(Simultaneous speaking.)

MR. GREEN: Hi, Vicki --

MEMBER BROWN: This is Charles Brown. I wanted to echo Vicki's thoughts, particularly discounting the operators specifically but also the thought process that maintaining the high standards -- which was stated in the introductory comments -- maintaining the high standards of the past was kind of counterproductive to where we were going.

That's the way I read the comment, counterproductive to where we're going in the future with this rule. So that's somewhere disturbing to me, to cut the operators out and/or either to not cut them out, but then think they don't need to be as well trained. I just have a psychological problem with that, that's my thought process.

MR. GREEN: This is Brian Green, I'll respond to both of those together.

We are not making any assumptions that the operator will be cut out, we understand that that is a desired place for the industry to go and we're attempting to be flexible, and create a rule that's

flexible that should somebody be able to propose a design that relied very little on a human, that we could scale the oversight to that particular facility appropriately.

Now, whether anybody or not can ever get there and prove that to us, that remains to be seen. But, I don't want to send the message that we're assuming that that's the way things are going to go, we're just planning for the flexibility to have a rule that adjusts the regulatory oversight accordingly to what the facility design needs.

And Vicki, I agree with your statement that, you know, when an applicant comes in some of the design is still unclear. So, you know, when we get into the human factors, the scalable human factors, we have designed a process where we will, you know, consider what we know throughout the pre-application process and adjust that as we go as we learn more about the design.

But we are sensitive to that fact that, you know, the design on day-one is not necessarily the same as it's going to be by the end of the licensing process.

MEMBER BROWN: At some point you have to make a thought that -- it's still walking past me to

think that, yeah, that's where industry wants to go, where they can totally divorce a site and you're just giving them the flexibility to justify that.

At some point I just think the NRC should be putting their foot down and say, no, we will have operators regardless. I'll quit with that.

MEMBER BALLINGER: This is Ron Ballinger. I'm going to, I guess, extend a little bit of what Vicki was saying.

I'm assuming that you're connected with both, the NASA people and actually the state of the art of the aircraft industry, they don't use the term self-reliant mitigation but that's what it is.

And what they have is kind of a supervisory program which, for lack of a better word -- I'll use a buzzword, I'll call it a digital twin, but maybe not -- where, at least in the NASA case, while there's obviously no operator if the device is 200 million miles away from the earth, but they have rules by which they calculate what they call time to critical event in the case of a satellite.

And in the case of an aircraft, like the 777 or the even newer ones, they have the same kind of thing which these planes will fly themselves from take-off to landing with no operator intervention,

except to change the coffee cup.

But if something is going wrong the system kind of detects it and then lets somebody know that you're getting into a region of the operating envelope that's not quite what it should be, and that some kind of operator -- whether it's 200 million miles away or in the pilot seat -- has to take some action.

So I'm assuming you're cognizant of that stuff?

MEMBER BROWN: Also look at how well that philosophy worked with the Boeing issues, they locked the pilot out, he couldn't recover --

MEMBER BALLINGER: Well --

MEMBER BROWN: Because the software wasn't good enough.

MEMBER BALLINGER: Well, but the prime directive here is you can't fix stupid.

MEMBER BROWN: Well are we going down that path or not?

(Laughter.)

MEMBER BROWN: I'm just disturbed by thinking we're going to allow anybody to think we're going to allow these reactors to operate unattended, period.

MR. SEYMOUR: So if I could speak to those

points -- and actually, if we could just advance the slide, see the next slide number 107, it'll, you know, provide some additional information that we're get into it.

Because I kind of want to, you know, tie in some of this information to speak to those points. And what I think is essential to realize here is that, there's a few underlying principles that we worked off of.

One is that there's no circumstance where we completely remove a human being from, you know, from involvement with a plant, right, from an operation standpoint, it doesn't exist within our framework here, right?

The other thing that I just want to point out is that there's extensive gradations that go on here, and there's still a floor, right, so even though we may scale down requirements, right, there's still a prescriptive floor that's set, you know, that establishes a level of capability and instrumentation that we just don't go below, right?

So, again, you know, on this slide here what we begin to talk about are the criteria that screen which plants can have the generally licensed reactor operator versus, you know, plants that require

the traditional ROs and SROs.

And in conducting that evaluation, you know, again there's a number of factors that we look at but really what we're doing is we're trying to say, is there a credible context where, you know, the operator is going to have to interact with that facility in order to assure, you know, an acceptable safety outcome.

And, if that's the case, what we do is we keep things in the regime of having specifically licensed SROs and ROs, right, which, you know, as the NRC we come in, we independently evaluate, you know, to assess the competence and so forth to provide that independent check.

However, even when the plants do cross that threshold and, you know, qualify for the generally licensed reactor operators, that's where they end up, they don't go to a state of having no people, right?

So I'll give an example, for the SRO and RO plants, right? Again, you know, this threshold, right, the self-reliant mitigation facility technological threshold applies to more than just the operation staffing right? It's crosscutting in that influences how we consider the staffing of a facility

and the human factors engineering requirements as well.

So for a facility that has this, you know, this, you know, kind of foreseen credible, you know, role of the operator in assuring, you know, the safety performance of the facility, we're going to require that the state of the art in human factors engineering be required in all contexts where the operator is going to be in a position to have to fulfill safety functions.

For the plants that meet that threshold to be a self-reliant mitigation facility, what we do is we still establish that there's a minimum suite of indications and capabilities that the operator has to have. And those indications are derived from the post TMI, you know, HSI design requirements.

So again, you know, indications that would be indicative of core damage states, radiological release, and so there's a whole suite of those. So that's required whether or not that plant, you know, qualifies for that treatment.

Additionally we mandate from a staffing perspective, that the generally licensed reactor operator, even though we don't require the performance-based testing to show how many of them

need to be there, we establish a prescriptive floor that there must be a provision for continuous monitoring of the fueled reactors, and a continuity of responsibility for them across the life of a facility.

So what that equates to is that at any given point in time there has to be someone with, you know, some oversight of that facility. So again, you know, we have minimum indications, we have, you know, that minimum, you know, staffing floor that we put there.

And an additional factor that I think it's very important to point out is that we also mandate that the generally licensed reactor operator, you know, has a dedicated set of capabilities that they have to have.

And this is something that, even if the human factors engineering requirements were to scale down to close to zero for these facilities -- because there's no human role in the safety functions -- these operators, right, we still mandate for these self-reliant mitigation facilities that the generally licensed reactor operators have to have the capability to shut down the reactor from their location.

To, you know, essentially be able to monitor those reactor parameters and those other items

that I described before, you know, indications of core damage state, you know, so on and so forth. They have to have the capability to implement notifications that may be required, again, if they have emergency plan responsibilities.

And also, perhaps as importantly, they have to have the capability of dispatching operations and maintenance personnel to that facility. So again, what we do is we establish a floor, you know, below which no more, you know, gradations and capabilities occur.

Now, what about the capabilities of the operator themselves, right? And again, we'll get into this when Theresa goes through the operator licensing, you know, process. But what we'll see is that, you know, nearly identical, you know, testing and evaluation, you know, measures are established under the guidance for what we would look for in SRO and RO, you know, examination programs, as well as for the GLRO programs.

A key difference is the regulatory footprint that we have there, so in both cases we're reviewing them against essentially the same standards, it just really comes down to, are we going out there and administering, you know, those examinations. And

then there's also, you know, the general licensing aspect of it.

So again, there would be the same type of rigor expected in going through, you know, a task analysis that looks at what the required, you know, job responsibilities are for those generally licensed reactor operators, and testing them to make sure that they do have that confidence. And then, you know, for the ongoing re-qualification supplement assessments and so forth to make sure that they maintain that, as well as proficiency.

So again, what I want to do is really just dispel this notion that we ever go to a state of having zero people in the loop.

MEMBER BIER: So this is Vicki Bier again. I understand that and I understand that, yes, there may be reasons to have fewer people in the loop, or less requirements on the people who are in the loop.

But I'm still just concerned about the language setting a wrong expectation, because your description that a licensee could come in and persuade you that their design is sufficient, that they can be considered self-reliant. You may nonetheless find sometime during the life of the facility that, oops, they weren't actually self-reliant and there was an

unforeseen circumstance.

So I just feel like the language kind of sets a little bit too high an expectation -- and I don't have new language to propose but something that is, you know, more like anticipated self-reliant, or whatever. But says, hey, we may learn as we go along, so.

MR. SEYMOUR: That's a fine point, too, that -- this has come up in one of our earlier discussions as well. And I just want to kind of weave Bill Reckley in the discussion as well in case he has anything to add, but one thing that we talked about in the past with us is that the NRC retains a very broad authority to modify, suspend licenses, right, issue orders if we find that there is a condition that is going to be unacceptable from a public health and safety standpoint, right?

So we do have regulatory mechanisms that we can go through to take action and require. And again that's a circumstance where backfit does not apply, right? So if we need to order that a licensee take a certain action and modify that license or whatnot, because there is some unacceptable issue that hasn't revealed itself and that puts the public health and safety into an unacceptable state, then we do

retain that authority to do so.

So something I think is important to keep in mind though is that would that type of a revelation -- once we've licensed the facility, would that necessarily automatically equate to needing to adjust the staffing such as for example taking a general licensed reactor operator plant and shifting it to being a SRO/RO plant be in order or something like that?

I think what we probably would have to consider is that the licensee; and by that I mean the facility licensee, would have to determine whether or not they wanted to try to address whatever the underlying issue was via an engineering means or via a staffing means.

So again, if the issue is that there is some inherent or passive safety characteristic or feature that we had predicated -- our designation of this facility is being self-reliant -- on and later on we find out that there's some performance issue, there's something that appears in the data and we find out that we can't make that assertion anymore, then I think the logical next step in that process would be in the licensee going to remedy that by adding a new safety feature to address that or are they going to

leave it relegated to something that requires human action to assure the safety performance of the facility? And in that case the (audio interference) treatment.

So again, I think that's an important point to bring up, just that the regulatory and legal mechanisms are there, right, to take those actions to protect the public health and safety on our part as the regulator. And also that there's more than one possible outcome for how a facility licensee might choose to address that just based on the nature of the assessment that's done to determine whether a facility is self-reliant or not, right?

Because inherently what you're getting, and pardon the pun there, but what you're getting down to at a fundamental level is this use of safety features that are generally going to be inherent or passive, perhaps under certain concepts even active, but again there's something that you determine about their performance that leads to questioning the designation of that facility. So again, there's an avenue where potentially the fix to that is engineering instead.

But, yes, I just wanted to see if Bill Reckley had anything that you wanted to add on that,

because I know we've had some good discussions in the past.

MEMBER BROWN: Before Bill says anything, could I ask a question?

One of your sentences early in your discussion in response to Vicki relative to, quote, a plant being self-reliant. And then you said something; and I'm hoping I'm saying this correctly, was that the NRC's thought process would be that no matter where the operator is he would be able to intervene, which gave the impression that the operator could be 500 miles away, a remote operator that's trained to take the action. That implies then that you have some very significant method of communicating and trying to take action that is not a manual backup to significant automated-type systems. And that's very hard to do from a distance outside the plant in some other city.

I am not sure that -- that idea of no matter where the operator is he'll be able to take manual action infers that your automated systems are accessible via the internet or some wireless means such that they could then actuate the stuff, the equipment, which is also software-based, which may be malfunctioning. That just seems to me those doors

being half open just leads to a lot of difficulties. Just throwing that in.

You got to be careful when you're thinking about this kind of stuff. There are a lot of ramifications. Operators are important. They're probably the most important thing we have in the plant and on-site with a manual backup that overrides or that can bypass the software-based or automated systems is pretty critical whether you've got a self-shutting-down plan or, quote, a safe plant, they've all got uranium in them. They've all got a propensity to do something we don't expect. So maybe I'll give up after this.

MR. SEYMOUR: No, those are absolutely all legitimate concerns that weighed heavily in our thinking. And something else -- just like I wanted to emphasize the point that we never truly take the human out of the loop in this paradigm, something else I want to point out is that we -- and again, by that I mean operator licensing and human factors engineering, and basically the team that worked on this particular set of requirements -- we are not the cybersecurity folks, right? So again, what we don't do is -- within the course of our language here is we don't establish any requirements that would govern the cybersecurity

implications or so forth, right? That's outside of our wheelhouse. And that would be a matter that we'd have to have other folks speak to.

When I discussed the language in question, right --

MEMBER BROWN: I wasn't dealing with cybersecurity. I was just talking about manual backups to automated systems that are failing that we've been relying on with operators hundreds of miles away, not cybersecurity issues. Don't conflate and mix the two.

MR. SEYMOUR: Okay.

MEMBER BROWN: Those are two different issues.

MR. SEYMOUR: Yes, I appreciate that.

MEMBER BROWN: That was not relevant to this particular discussion. That's my only point.

MR. SEYMOUR: Yes. And so what we do is we say that the general licensed reactor operator has to be able to shut down the reactor from their location, right? And again, we leave that where it is. So within a traditional framework that means a location that's somewhere co-located with that reactor, right? So again, we leave our language where it is, but we don't weigh in on the broader

ramifications of remote operations.

But what I would say is there's also another layer to that language as well, too. And what we require is that the operator has to have the ability to dispatch maintenance and operations personnel as well, right? So a general licensed reactor operator, besides have the capability to shut the reactor down, also has to have that ability to dispatch maintenance and operations personnel. And part of our reasoning, part of our rationale in establishing that requirement was to leave the door open for those types of local manual actions should they be require.

Again, what we see within the legacy fleet that's out there is that you'll have reactor operators and senior reactor operators located in a control room. And when there are circumstances that require local manual actions out in the plant, generally -- and there are times where the licensed operators would actually go do it themselves such as a control room evacuation. But generally speaking what they're doing is they are directing non-licensed equipment operators to go out there and perform certain field actions.

So our rationale in including that requirement was to achieve a similar type of

functionality. Again, for the sake of that self-reliant mitigation facility technological designation we don't want those types of things to have to be credited to meet the analytic requirements. However, that being said, from a prudent standpoint we still want that capability to be there for those reasons that you discussed. You get out in that un-analyzed, beyond-design-basis-type of space into some situation that was never envisioned.

And just from the standpoint of prudence it's wise to still have that trained and qualified operator who has the capability to shut the reactor down and also to get individuals out into the field to take local backup actions that may be needed. But again, the difference is with those types of facilities we don't want that to be credited in meeting the analysis.

CHAIR PETTI: I see lots of hands. Dennis, why don't you go, and then Greg?

MR. BLEY: Okay. Yes, I'm kind of coming back to where Vicki was talking with you earlier, and it's a mix of what's actually in the rule language. And the way Brian introduced this in some of your language leaves a little area of discomfort. Now it might well be that we need a different kind of quality

and depth for these general licensed operators and maybe it's not the hands-on kid of activities we've seen the past. Words that worry me are credible and self-reliant, those kind of things.

We always get surprised by something we though was incredible somewhere along the line, and an operator who understands how this system works and how it might fail perhaps beyond those things we call credible is going to be important. Your idea of having a capability floor for the operators makes sense to me and I think that's the way the rule language is pushing.

The thing Ron talked about; and I don't think you gave him an answer back, or maybe you did, a computer system that monitors the operation of the facility. And not so much operates it, but alerts someone when the machine isn't responding the way the computer system was trained to expect to respond is really a very useful idea and seems to me it might be very important to include.

I think all of us are a little worried about designers' and perhaps regulators' hubris and naivete on a new machine that's better than the others because we solved problems, but until we get a pretty broad base of experience we ought not have as much

confidence as we do in things we've observed for many years.

MEMBER BALLINGER: It may be that every one of us has sworn up and down that one of our designs or experiments are perfect only to find out that we've been hoisted by our own petard.

MR. BLEY: It's happened to all of us I think. That's all I want to say.

MR. SEYMOUR: So, if I could speak to that. What I want to point out is where some of the mechanisms that we have built in tend to address those interfaces irrespective of how involved the automation might be.

And so what I want to begin with is let's start with a plant that doesn't meet the self-reliant mitigation facility criteria, right? So a plant that has our traditional SRO and RO staffing. What they're going to be required to do is they're going to be required to apply the state-of-the-art in human factors engineering to essentially any place where they're going to have those interactions for fulfillment of safety functions.

So again, if you're talking about automation that is involved in those plant safety functions being fulfilled; and by that we're talking

about generally things like reactivity control, heat removal, control of radioactive releases via containment or functional containment, then what we're going to expect is that state-of-the-art human factors engineering be applied.

And traditionally that's involved something that's akin to NUREG-0711-type of process where a designer goes through this essentially systems engineering process that's been adapted to human factors engineering. Again 12 steps from the operating experience all the way through task analysis continuing on into design of the HSI, verification and validation and graded system validation, resolving discrepancies and so forth, and then ongoing performance monitoring.

So again, we don't intend to step away from that type of requirement.

And again, if you look at how does that -- how would that get involved with a heavily-automated facility, well again those are the types of things that are going to integrate into the task analysis, right, into the training and procedures aspects of that process. There are things that have to be vetted out in the integrated system validation. And also as you move through that process what's going to come out

of that as well, too, is the influence on staffing.

So again, staffing -- and again, Maurin will talk about this later, but when we get into how the staffing plan is reviewed for those types of facilities, what we would find is that again it doesn't mirror all the steps of that human factors engineering process that I've described, but it borrows fairly heavily from that. And what it does is it applies this performance-based approach to essentially confirm that the number of operators via performance-based testing is going to be sufficient to fulfill what's needed for safety.

And what we've seen historically when that type of a process has been applied is that operators are put into challenging high workload situations with failures of the automation and so forth to make sure that that staffing complements can use the procedures, the training, and the human system interfaces that are provided in the presence of those types of failures, right, under high-workload conditions and still mitigate that that's successful and so forth.

So again, on that side of things we've got mechanisms that are going to cover a range of automation going from things that are very manual-intensive all the way up through the hypothetical

almost fully autonomous facility.

When we're talking about plants that have the generally licensed reactor operators, again the threshold to get into that regime was that even down to the level of defense-in-depth, we went through and we said that there isn't a human role to meet that analytical requirement. So at that point what we do is again we set that floor for capabilities. And again, we discussed what that looks like and so forth, but again the difference is is that by virtue of those analyses what we've done is we've said that we credibly don't think that that human role is there.

And what we do is we instead kind of fall back on that minimum capability floor such that there still be someone that's there in the loop, someone with that minimum suite of indications, like capabilities and so forth. We just don't require the performance-based testing to necessarily go through and vet that out. And again, that's predicated on those very rigorous analytic requirements being met. And that's something that I'll be speaking to a little bit more on this slide as well.

MEMBER HALNON: Jesse, it's Greg Halnon. This discussion has been very, very helpful, but there's a couple of things: One is that as you hear

the primary concern we're dealing with now is the role and qualifications of an operator. And you go often go back to the administration of the licensing process or licensing status to answer that. And I think that we need to separate the two issues.

There is a level of automation that may decrease the requirements for operators, and I don't think you've heard -- I haven't see any concern with the K&As and other things that we will use to qualify the operators. I have a couple things about the administration of the licensing process that we'll probably get into, but the key thing is is that we are talking about another class of operators that we're perceiving to me less qualified or less rigorously trained that the SRO and RO. I don't think that's the case. I think there will be fully-qualified operators for what they need to do.

However, we're doing this because -- and I think it was talked about by Brian as well, that it's going to reduce the cost and increase flexibility. I haven't seen a study or any kind of analysis that shows what the cost savings would be versus the potential I guess lack of increase in safety. I don't want to say -- because I think the words were that we didn't need as much training.

But is there a study out there that -- I mean, this is a good conversation and a lot of gut feels and other things, but is there a study that actually quantifies all these discussions that we're having that shows that everything we're going through to get a GLRO is worth it from the standpoint of a cost savings?

MR. SEYMOUR: Yes. So there's a regulatory analysis that we've been working through, or have actually done some tabulation of that. And when I get done here momentarily I'll see if Aaron Sanders is willing to speak to that a little bit.

So one thing that we've done is we've gone through and we have studied for plants that would have SROs and ROs that would come in under this process and just encounter the new flexibilities and so forth that are involved here. What it projected, cost savings over the course of -- a 60-year facility life would be again 40 years plus a license extension.

And we've also gone through that experiment to -- kind of thinking through for the general licensed reactor operator facilities what that type savings would amount to over the course of facility life as well.

And again, I'll see if Aaron can speak to

some of the data that turned up in that a little bit more. And again, Theresa Buchanan and I worked with him fairly extensively on that.

What I will say is that by and large just by virtue of the flexibilities and some reductions in the regulatory footprint at various points you do see this aggregation of savings.

Now what I would characterize it as is for plants with SROs and ROs there's a modest savings over facility life. And for plants that qualify for general licensed reactor operators I would characterize that as being a significant savings over the life of the facility.

Now it's important to realize that there is some cost associated with the development of these programs, right, because they have to be developed to customize the facility. There's a little bit more review work that's involved on the front end, whereas a lot of the things that we're talking about in Part 53, if we say that there's a savings, a lot of times it's pointing to perhaps savings on the front end.

With these costs what's important to realize is it's a little bit different because these are costs that are realized over the life of the facility. And depending on the stakeholders involved,

I think the discussion can sometimes go in different directions. If you're talking to someone who's interested in building the plant, designing it, selling it to an owner-operator perhaps, they're looking at those costs from a different angle. The owner-operator is probably the party that's going to benefit the most from that, right, again that modest savings over the life of the facility for the ROs and SROs. And again, a significant savings for the GLROs.

So again, that's where I think the key point is that we approached this in a very methodical way because by no means do we ever want to sacrifice anything that's needed for providing for public health and safety and ensuring that only suitably qualified individuals get into these positions of great responsibility.

MEMBER HALNON: Can you share cost study with us?

MR. SEYMOUR: So, yes, Aaron Sanders, if you're willing to speak to it? Again I'm not sure how much you can get into in the specifics, but are you able to discuss any of that?

MR. SANDERS: Yes, hi. So Aaron Sanders, cost analyst at the NRC. So I'm the cost analyst for this Part 53 rulemaking. And I want to be cautious

here because there's a draft estimate still under review. We haven't gone through concurrence yet and we're still actually hashing things out as we finalize the rule language.

But what I can tell you is that due to scalable training program requirements for the RO/SRO we're looking at about a half an FTE per year saved, which comes to about $1 million across the life of the plant using a 7 percent net present value; a lot more in un-discounted terms obviously.

And then for the GLRO Program it's much -- it's greatly simplified, if Jesse will allow me to summarize it that way in layman's terms. And that's more on the order of one-and-a-half FTE per year. So you're looking at more like over $3 million in savings across the life of one of these plants while operating. And again, that's 7 percent net present value.

I'm not comfortable releasing more, but if you have any questions about that, we can --

MEMBER HALNON: I don't think that's -- qualifies, Jesse, as significant. That's actually within the noise of an organization, even a small organization. I would submit that all the discussion that we're having on GLRO and the discussions you're

going to have on the next slide is moot because you're really not showing any significant savings at all. And in fact it sounds like we're -- and it feels like we're backing away from the standards of the Part 55 that we've been enjoying so many years. And that's just my opinion, but I'll let you go on and discuss the next slide, see if anyone else has it.

But I do want to go back and reemphasize two points: One, the self-reliant mitigation facility. I mentioned yesterday that I think you would benefit from getting a succinct definition under the definition section so you can use that succinctly throughout. And there are some nuances and some confusing language that's in there right now.

And then the second is that the -- we need to continue to separate the administration of the GLRO Program discussion from what we've just been talking about, which is the role and qualifications and levels of licensing for the operators at these facilities.

So I would enjoy looking at the cost analysis when you finally get it. A million-and-a-half dollar savings or three million savings over a 60- year life or a 40-year life doesn't excite me all that much.

MR. SEYMOUR: What I would contend is that

again what we have to keep in mind is the sheer range of facilities that we're talking about under Part 53. And we're talking about the generally licensed reactor operator approach, just by virtue of the criteria that are used to get there, in many cases the types of facilities that we're probably thinking of -- and not necessarily, right -- it's possible that larger facilities could potentially get there as well, too. But we're probably talking by and large mostly about microreactors.

So again, when you're talking about microreactor facilities, if we envision this hypothetical microreactor that has maybe one or two operators at it and just some type of a very scaled-down reduction of support personnel associated with it -- again for a large light water reactor, again $3 million over plant life. And again, I used to work for a utility. You're right, that would be a drop in the bucket.

But when you're talking about a microreactor again where you're running that place on just a few FTE at best -- and again, I'll see if Bill Reckley or one of the other folks can speak more to this, because we have engaged in some work where we've actually received some study numbers about what the

FTE margin might be for such a hypothetical microreactor facility. And it really is -- it's very, very lean, right?

So again, when you're talking about three, a little bit more million dollars aggregate over that life, for a large light water reactor that's nothing, but for a very small facility that's just running on just a handful of FTE, to be quite frank, our perspective is that could make or break the business case, right? So what that does is it justifies us taking a very deliberate look at is what we're requiring necessary for safety, right? Because if it is, then to be quite frank, the entities on the other side of the table need to find a different business model, right? We won't compromise on what's necessary for safety.

However, if there's a reasonable spot that we can get to where we don't compromise on safety and we require what's truly necessary and it provides that type of a reduction, then that could be a spot where perhaps taking a fresh look at what's required within those contexts could potentially influence I think the commercial viability of some of these entities. Now again, that's not our role, right? That's not my perspective coming into this that I'm necessarily

worried about whether these businesses succeed in that regard. What I'm worried about is safety.

However again, once one of the commissioners has said in the past that really stuck with me is that we can't regulate ourselves to zero risk, right? So again, what I want to do is take a very balanced look and ask that challenging question about what's necessary for reasonable assurance and safety in this context.

And again, if there are places where we can adjust those requirements what I don't want to do is I don't want to say let's not make the change because it's going to be an insignificant cost for a large light water reactor, right? I don't want to do that because again we're looking at a very, very wide range of facilities that are out there.

But I did want to give a chance if Bill Reckley --

MEMBER HALNON: I agree with what you just said, however there's also a scalable savings for large versus small and that's why looking at the assumptions in the cost analysis would be crucial.

MEMBER BALLINGER: This is Ron Ballinger again. I mean, we're getting into an apples and oranges comparison now. There's a big difference

between head count and GLROs in terms of cost. Is that right, Greg?

MEMBER HALNON: Well, yes, that's what I'm just saying, that there's a -- you have a scalable cost or a savings. If you only have one or two FTE on site on a microreactor, then the savings are going to be much, much, much less than -- I mean from a dollar -- that's a value of the dollar amount than it would be from a large light water reactor that you're trying to license 25 people.

So that's why looking at this cost analysis to convince me that all this discussion and the reduction in requirements for the operators and the licensing aspect is actually worth it.

And just the qualitative discussion tells me it doesn't sound like it's worth it and that we should just go back -- and again, we're on pretty much the next slide -- why shouldn't we just do like we do now, which is different technologies and different plants have different NUREGs that basically implement Part 55, but the licensing aspect is the same.

So I just don't get the cost savings and all the time and effort we're spending on this. And I'm not sure why we're even going there. So we weren't comfortable with the certified operator. You

brought the GLRO in and basically gave us the same program and just said we'll call them licensed. And I think, as you can tell, we're still not comfortable with the reasons of why we're doing this.

And I think that's what you were talking about, Ron. I mean it doesn't seem like we're really -- we're spending a lot of time and effort on an area that's really going to make a big difference.

MEMBER BALLINGER: Yes.

MR. RECKLEY: This is Bill Reckley.

MEMBER SUNSERI: (Audio interference.)

MR. RECKLEY: Go ahead. I'm sorry, Dave.

MEMBER SUNSERI: Yes. No, this is Matt Sunseri.

Hey, I just want to give kind of a -- maybe a little different perspective on this thing. I've looked at this whole section, 70-53, 725 through 53, 830 and all the Reg Guides or ISGs that support it, and there's a lot of detail in there and I think Jesse's doing a good job of explaining the details that are actually in these documents that does not appears on these slides. And what's not appearing on these slides is causing us a lot of concern, but if you get into the details a lot of that concern goes away.

And I think when I look at the GLRO Program, whatever -- however, the Generally Licensed Operator Program, what the staff has done, at least in my opinion, has followed their -- what I'll call precedence of the past of creating specific Reg Guides or NUREGs for the different types. You've got the PWR, the BWR, the NPUF facilities, all that stuff. So the process that they're outlining in these documents for the GLR -- generally licensed operator is -- follows that process almost identically from a systematic approach, the K&As and all that stuff.

What it only lacks is -- what Greg I think was getting into earlier is the administration of it, right? Who approves the license for the operator and when does it get applied -- approved? Instead of being individually licensed like the SRO and ROs are you get a facility license through the process. But at least from a safety perspective in my mind -- and I'm going to not even get into the cost part of it, but from a safety perspective it seems like all the elements are there. And I'll just leave it at that.

MEMBER HALNON: And, Matt, I agree that Jesse's made a good case of where the programs are comparable, if not equivalent in many ways. And I agree with you it's in the administration, and that's

the same position we had with the certified operators. It's in how it's administered by the licensee and where the NRC is inserted or not.

So I think that's where we have the biggest issue and I think could probably have more dialog on administration of it.

Like I said, the ISGs and the K&A's and all those other items, I have no issue with it. I think the operators will be qualified for what they need to be doing.

MEMBER SUNSERI: So I'll just add one more piece and then I'll stop, but I think some of our concerns about the way the Certified Program was going to be administrated we were concerned about accountability of the operators to their performance and to the public in general. But so I think the staff has addressed that. They put a lot of hooks in there about what to do with the operators if they don't perform well. It's written in there now, which I didn't see before. But I'll leave it at that.

MEMBER HALNON: Yes, I think my only big issue with it now from an administration is how do you deem a licensed operator on the list? And, Jesse, this is just a point that -- a comment that I think that you should require at least NRC concurrence

before a licensee says this person is generally licensed or on the list for licensed operators. I think that there should be some interaction and some at least concurrence or verification by the NRC that the program has been successfully completed, the person's not on any other kind of, for lack of better term, terrorist list or person of concern list and what not.

So after the person gets through the training and takes all the tests the licensee gives them I feel like there should be some concurrence and verification by the NRC prior to that person assuming licensed duties. But that's a comment that I have that I -- if you want to respond to that or just write it down as a thought, that's fine.

MR. SEYMOUR: No, I will definitely capture that. It's a good point. This is a delicate balance we've been trying to strike here. Again, the notion of general licensing of operators is not something that we've historically done in the past. And I made the comments at one point that this is the first time since about 1956 that we've actually modified kind of the hierarchy of the license levels and so forth by considering a new one.

And what we currently have built in is

that there's an annual reporting requirement to report the names of operators who are under the general license. But again, what that doesn't address is your concern about that happening prior to them being able to assume those duties.

I've captured that. That's something that we'll have to think through. There are some legal kind of aspects of a general license versus a specific license and how that mechanism works, but again that's just something I'll have to take for further kind of review amongst the group and so forth. Again, it's a point that's not lost on us.

I think something to keep in mind, too, is also that there are other programmatic features outside of operator licensing that do tend to buttressing a little bit in that regard. One is that you'll still have the -- your Part 26 and Part 73 requirements. So again, there will still be provisions for behavioral observation, right, for these individuals. So again, issues of aberrant behavior and so on and so forth. And there will also still be plant access requirements, right?

So again, in terms of again the terrorist watch list, I mean it's a good example, right, of okay, well, how do you account for that, right? And

again, there are certain things that we do in the current operator licensing process with specific licenses. For example, when we go to issue a license, one of the things that we have kind of a trigger to do in NUREG-1021 is to check to see if that person has had significant enforcement action against them in the past, right? So again, that's something that's embedded on their specific licensing. And we don't -- under a general license approach we will have the same corollary there.

So again, all I can say is that I jotted that down and that's something that we'll definitely chew on and see what we can do it.

Okay. Yes, so if it's okay with the Committee, I'm going to go ahead and just move onto this next slide.

CHAIR PETTI: But I thought Bill wanted to say something.

MR. SEYMOUR: Oh, sorry. Okay. Yes.

MEMBER RECKLEY: It's largely been said. The only thing I was going to add; and this goes to some of the previous comments about operating experience and the entry into using some of these provisions that Jesse's talked about, is keep in mind the burden of proof would be on the applicant to

actually show they meet these and that they've done the testing of the machine to prove their point.

In that regard I think it's likely that you would see a transition. And just like the example that was brought up with driverless cars, you have a transition. And we're not there yet, but we're going through steps, right, where the machine takes on some responsibility but you still have a person. Will we get there? Most likely, but there will be a transition. And I think just like any other engineering exercise you could foresee something like that happening here where you would not go basically from -- in a binary step from what we have right now to basically the full implementation of what we're putting in Subpart F in Part 53.

So just something to keep in mind that this -- these machines will have to be tested. Operating experience will have to be gained. It's not as if we have to be necessarily fearful that we have one time to make a decision. And like I say, it's a binary step. It's going to most likely evolve. The rule is trying to be written such that it can reach the end point, but that doesn't mean you reach the end point on the first application that we receive.

So that's all I was going to add, Jesse.

MR. SEYMOUR: Bill, if I could just ask while we still have you, are we at liberty to discuss the feedback that came via the recent study that we did with MIT? Is that something that we can discuss or --

MR. RECKLEY: Well, we can certainly say we had a conversation and that there's a study underway, so if you want to fill in some of that. But the regulatory analysis, as Aaron mentioned, we're working on. That will be part of the rulemaking package to the Commission. We won't have it by the Full Committee meeting.

But to Jesse's point, in terms of what's a significant amount of money, if you're a 10-megawatt microreactor and you're able to charge $100 a megawatt hour, that means you have an income of $10 million a year to pay for the machine, to pay for all the people, to pay your taxes, to pay the NRC. So economy of scale, there's a reason that the reactors went bigger. The microreactor model is a very challenging model, and this is financially. And this is what Jesse was mentioning. There's a study underway. And we talked to some of the people conducting that study on the potential financial challenges of microreactors.

But, Jesse, you might recall --

CHAIR PETTI: And, Bill, they've also -- it probably predates you guys' interaction, but they have published papers on the cost, kind of a work backwards. This is what it needs to be for the whole business case to hold together. And your comments are spot on. It's the eye of the needle for them to be able to make their business case. And O&M costs are really critical. And that's been published. That's on the literature.

MR. BLEY: Hey, Bill? I was going to bring this up at some other point, but since we've talked about the cost benefit analysis -- it jumped out at me in the -- I guess it's in the preamble that we just had blanks in there. Usually we get to look at those and comment and sometimes we've found that to be useful. Are we going to get a look at that at some point so we can comment on it?

MR. RECKLEY: I'll go back on air. And I guess I don't think we're going to have it ready by the Full Committee meeting, so I --

MR. BLEY: Well, this kind of works into the question a couple people asked yesterday of are we going to get a chance to review some of the guidance and other things that's coming out over the next many

months before we get to a final draft rule stage? And you know --

(Simultaneous speaking.)

MR. RECKLEY: Yes. Well, yes, that --

MR. BLEY: -- it could kind of work.

MR. RECKLEY: Right. Yes, that will be the case. the regulatory analysis will be done, and we could talk about it at that next stage after the publication of the proposed rule. Yes, we could come back. At that point it will be -- it will have been issued. And that's likewise some of the guidance documents. We just couldn't get it all done in the schedule. But as we continue to work on it we'll be continuing to bring it to ACRS. And quite honestly, it's going to continue afterwards, right, even after Part 53 is a final rule. Part 50 has been a final rule for 60 --

MR. BLEY: Seventy years, right?

MR. RECKLEY: -- more than 60 years and we're still preparing guidance. So it's not a -- we'll continue that forever.

MR. BLEY: Okay. That works. Thanks.

MR. SEYMOUR: Okay. Yes, so I wanted to kind of circle around because, Bill, I know you had mentioned if we could bring Aaron back in just to

round out that comment.

But, Aaron, did you have anything that you wanted to add?

MR. SANDERS: Yes, I thought I should. As far as when the RA might be able to be seen by the ACRS, I'm not familiar with that occurring before essentially the package is ready for the Commission, the specific timing. So the way that the schedule has been working out I'd really rather have the PM speak to that. But I don't think it would be in a finalized enough state by the Full Committee meeting on the 2nd of November, but I am working of course as fast as I can, which is -- there's a lot of motion still on this rulemaking.

As far as the numbers, I just wanted to go back because when we're talking about $10 million a year in income, I realize that it's probably better for me to speak to the un-discounted costs then. Because if you're saying 10 million a year in income, then what is the savings of the GLRO Program, which is about a third of a million per year, which comes to three-and-a-third percent of the income in that example, which it's not mind-blowingly high. But it's not dismiss-able either, especially since there are lots of other costs that obviously come out of the

income. So I just wanted to point that out. That's a better way to think of it, is about three-and-a-third percent of a $10 million plant's income per year.

MR. SEYMOUR: Okay. So --

MEMBER REMPE: So, this is Joy, and I guess I'm thinking about sometimes when we hear members comment about why are you guys doing this research, and the response RES gives back saying, well, we have to be ready. Even if we don't think it's worthwhile, we've got to be ready. And I'm wondering if the same argument should be mentioned here that hey, folks are asking for something like this and even if it's (audio interference) significant benefit to them, that's their decision. We're just trying to give them an option that's safe. Is that a response back that could be mentioned here?

MR. SEYMOUR: Yes, and I do appreciate that. One of the things that we've spoken to before is that we desire to create a rule that's durable. So what we want to avoid is as technologies evolve, as concepts of operation evolve, as we get further down the road and perhaps we move into reactors that are operated remotely and so on and so forth, when we cross that bridge, what we don't want to have to do

for these operational requirements is have to go back and engage in rulemaking because we didn't kind of build these possible avenues into the structure.

And so what we're trying to do is we're trying to think through those issues, and part of that involves looking at kind of the future-focused research-types of endeavors that we undertake where we go and we look at various things that are out there; just examples of that like remote operations, adaptive automation, right? These are all things that our Office of Research has dug into and done significant work on and so forth.

And so what we've done is we've tried to take those concepts and what we learn from that and bake that into the mix, at least put that into the thought process and say if something like this were to emerge, even if requires an exemption to do it for a given regulation, will the rest of the structure accommodate that?

And so I think that speaks to that point, but again having that -- I hate to use the term crystal ball, but that's really what the research does, like keeping your finger on the pulse of these various industry initiatives, the technological developments, and being forward thinking with the

research lets us kind of see which way the wind is blowing. And again, what we don't want to do is say like, okay, we have to accommodate this, right? Because again, we have a different mission, right? Our mission is to be good stewards of the public health and safety, right? That's our first and foremost consideration.

But what it should do is say well, hey, this may be an emergent technology or way of operating these plants that comes up. Is there a way to accommodate that while still being faithful to that role that we have? And if so, what direction do we need to think in to get there?

CHAIR PETTI: Okay. Jesse, we've been at this for a while now. We're well behind. So I hope we're going to be able to pick up the pace.

I just want to say that I still have an issue but I don't want to deal with it here because of the time, but when we get to Full Committee this -- your definition of the self-mitigating facility and the AERI definition of what it takes to get in there, there's an interplay there. And we were concerned that it may have been overly restrictive.

So it would be worth in the Full Committee at least being able to spend some time, because it

seems to me that AERI and GLRO, there is some natural synergies there, at least in the microreactor space, and wanting to make sure that we're not unduly constricting things. This is probably more from an AERI perspective than from a GLRO perspective, but given that they're now linked through this somewhat of a definition we want to be able to go through that and make sure that we have it set properly in our minds.

MR. SEYMOUR: Okay. Yes, definitely. And I made a note on that yesterday, so I did capture the point from the Committee about concerns that -- limiting things to inherent and certain pedigrees of passive features that are -- perhaps the implications of that may constrain things too much. So between now and the Full Committee that's something that myself and Marty Stutzke and the others will --

CHAIR PETTI: Right.

MR. SEYMOUR: -- continue to think through.

CHAIR PETTI: Great. Great.

MR. SEYMOUR: Okay. So continuing on with the next slide, I will try to pick things up a little bit. I appreciate the prompt.

So during earlier presentations with the Committee a common topic of discussion has been the

approach taken regarding the traditional shift technical advisor under Part 53. As noted in our more recent discussions we have balanced the value afforded by the availability of degreed expertise with broadened flexibilities under our proposed engineering expertise requirement.

Aside from some streamlining of the associated requirements the overall engineering expertise requirement remains unchanged from that that we covered in our prior discussion and it remains a required element of staffing plans for all facilities under both Frameworks A and B including for those facilities staffed by GLROs.

So again, when we're talking about the self-reliant mitigation facility and staffing considerations, something that's very important to keep in mind is that even for those facilities this requirement to account for engineering expertise would remain as well. So again an important point that I didn't touch upon earlier.

So in this way we see the engineering expertise requirement as providing an important counter against the potential uncertainties associated with new designs. And again, that is specifically because the engineering expertise role is explicitly

there to assist the operators when they get into situations that are not covered by their training and procedures. So really when those unknown unknowns emerge this will help to serve as a backstop there to support them.

So with regards to generally licensed reactor operators at the time of our previous discussions we had not yet extended the allowance for generally licensed reactor operators to facilities under Framework B. Under the most recent version of the preliminary rule language we have now done so including for those plants under Framework B that use an AERI approach to risk as well as those that instead conduct a PRA. Thus, a structure established under 53.800 now exists to assess whether GLRO staffing is appropriate for facilities under either framework and using either approach to gaining risk insights.

While there are differences in how the various criteria are structured and presented, fundamentally each of these sets of criteria are derived from a common set of considerations that include no human action being needed to meet radiological consequence criteria, no human action being needed to address licensing basis events, safety functions not being allocated to human action,

reliance upon either inherent or robust passive features with some provisions on when PRA is used to go outside of that, and adequate defense-in-depth being achieved without reliance on human action.

Additionally with regards to the criteria, in response to concerns noted previously by the Committee, wording modifications have also been made to the GLRO criteria to clarify areas in which the analysis should be limited to only addressing credited human actions and defense-in-depth capabilities.

And again, that speaks to a good point that was raised by the Committee about in the absence of clarifying how far you have to go with that analysis that you could potentially run something like defense-in-depth out through many layers. And really we just want to get through a credited level of really hitting that first layer of defense-in-depth and also getting through credited mitigative actions to say that that analysis is satisfactory for that purpose. And I think it's important to point out here, too, that by no way, shape, or form do we want to constrain the ability of operators to take prudent actions.

So what this criteria exists to do is to say that you're able to get through these credited analyses without reliance on human actions, not to

preclude those operators from being able to take action. So again, if you get into a circumstance at these plants with GLROs, it would be wholly acceptable for those operators to have actions to be taken for defense-in-depth, so on and so forth to perhaps trip the reactor and things of that nature.

The key difference is is that in allowing that plant to have that type of treatment in the first place we don't want that to be credited for safety, right? So again, these would be backup actions. These would be defense-in-depth actions. These would be prudent actions to put the plant into a given state before the automatic action happens, those types of things. But again, from an accident standpoint and from a fundamental kind of first layer defense-in-depth standpoint we just don't want those things to be credited.

For a non-AERI plant under Framework B the GLRO criteria are comparable to the equivalent criteria of Framework A as adapted to the differing requirements of Framework B. So again, some differences in pointers. A little bit of kind of tweaks in the language and so forth to adapt the same general approach of Framework A to Framework B. But again, there are five criteria for both and in the end

they're both accomplishing the same essential functions.

As noted previously, the Framework B GLRO criteria vary depending on whether an AERI is used. Although irrespective of the use of AERI, defense-in-depth without reliance on human action is a common requirement across both Framework B approaches: AERI and non-AERI.

That being said, for an AERI plant the GLRO criteria are met by meeting the AERI criteria. And yesterday during Marty Stutzke's presentation we did get into what the criteria looks like. And again, I did capture the point for the Full Committee discussion about revisiting whether those criteria are potentially too restrictive.

It should be emphasized that the AERI criteria located at 53.4730(a)(34)(ii) restrict the safety features that can be credited in meeting the analysis to those that are either of a robust passive or inherent nature that are resistant to the influence of human error. And again, that's the specific point that Marty and I will revisit between now and the Full Committee.

In short, these various sets of criteria have a common goal of identifying when operators are

not expected to significantly influence safety outcomes based on a design and to use this threshold to identify when GLROs would constitute the acceptable form of operator licensing for a given facility.

We can move to the next slide, please. One further area that I would like to discuss in this presentation before we move onto Theresa Buchanan and the operator licensing guidance discussion is the recommendation made in the Committee's most recent letter that the associated guidance for implementing 10 CFR Part 55 could be amended to accommodate the objectives of the proposed rule without the additional volumes of text. And this was a recommendation that we gave consideration to and carefully evaluated the related pros and cons of as we considered our response.

Ultimately we concluded that reliance upon Part 55 for operator licensing within the context of Part 53 could not yield equivalent flexibilities and in attempting to achieve similar levels of technological inclusivity would likely necessitate the development and upkeep of an unmanageable inventory of new guidance documentation for every new technology that subsequently emerged. And a key example of that point would be -- and again, this is just one example,

but it's a big one -- would be the need to preemptively develop and issue a NUREG series knowledge and abilities catalog for each new technology and to also accomplish that with sufficient lead time so as not to delay the goal of licensing operators should a Part 55-only approach be pursued.

In contrast the new framework for operator licensing under Part 53 is technology-inclusive by design and creates significant flexibilities compared to Part 55. Most notably however the statutory requirements of the Atomic Energy Act are such that the innovative approach to general operator licensing cannot occur absent rulemaking to create a defined class of reactor that would have such operators.

Thus, GLROs cannot exist under a Part 55-only approach unless a rulemaking were undertaken for Part 55 and such an effort is beyond the scope of our -- and by our I mean the staff's present tasking for the Part 53 rulemaking. Or revised or new guidance could be developed for use under Part 55. Applicants would be required to seek exemptions and justify pursuing alternative approaches where the existing provisions of Part 55 and NUREG-1021 processes were incompatible with new technologies and concepts of operation.

In contrast the preliminary proposed Part 53 will remove the need for such exemptions, allow for the tailoring of examination processes based on technology and operational approaches and enhanced regulatory reliability and clarity.

So in light of these considerations our perspective remains that the most appropriate approach to operator licensing under Part 53 remains an approach that borrows from yet remains independent of Part 55.

And with that being said, I'd like to go ahead if we could and move the discussion along to the key Part 53 review guidance documents that we'll be discussing today, and the first of those that we'll transition into will be Theresa Buchanan discussing the operator licensing programmatic guidance.

MS. BUCHANAN: Thank you, Jesse. Can I just get a confirmation you can hear me?

MR. SEYMOUR: Yes, I can hear you.

MS. BUCHANAN: Okay. Thank you.

Good morning, everybody. My name is Theresa Buchanan and I am going to be giving an overview, pretty brief. The ISG itself is very detailed. It's an overview of the Operator Licensing Program review. I'm going to start with what's not in

here in order to help manage some expectations.

This ISG does not contain how the staff will review and approve the training programs, the SAT-based training programs. The primary focus of this ISG is on how to review and approve the examination programs. And then there's a couple little additional pieces that we put in here for lack of a better place to put them.

Next slide, please. All right. So the purpose of the ISG is to help the staff review applications that come in under Part 53 related to the Operator Licensing Exam Program, and particularly reviewing the tailored approach to the exam programs for both initial and re-qualification.

This is for both specifically licensed operators and generally licensed operators.

Additionally it has an added thing about addressing proficiency. That's how often you have to stand watch in our licensed position in order to stay active in our license. So we address proficiency for the individually-licensed SROs and ROs as well as to assist staff reviews for non-large light water power reactor exam programs that might be coming in as exemptions under 10 CFR Part 55, primarily for the plants that are going to be coming in before the Part

53 rulemaking is in place.

Next slide, please. So the goal of this ISG is to enable facility applicants to identify; and that was mentioned earlier, the KAs or KSAs, the knowledge, skills and abilities that are needed for safe operation as the basis for exam standards; very similar to what we have currently, and establish reliable guidelines for exam program development that's based on current best practices from research and expertise on measurement and testing of these knowledge, skills and abilities.

So we worked with INL on the development of this guidance. We also had a workshop earlier this year where we included representatives from different industries, other countries to help get what they saw as their best practices in their industries for the qualification of individuals to try and make sure that we were casting a wide net so that we could get current best practices to include into this ISG.

Next slide, please. So the first section talks about the development of your knowledge, skills and abilities for the exam program. So although they are not two different lists I kind of conceptualize them this way because it makes it easier for me to think about it.

So basically what happens is the SAT-based training process, or SAT process that's used to develop the training program is used to identify a training list of knowledge, skills and abilities that folks are going to train to. It's not going to be solely limited to tasks that are associated to safe plant operation. They'll include other things that may be for economic purposes and things like that.

We have an ISG. It's 2023-04, Facility Training Program IG. It's planned to provide additional information in this area on how we would review and approve the SAT-Based Training Program. That ISG is not issued yet. It's in the process but it's a little bit further behind in the process. So we're working on getting that issued. But that will cover that aspect.

So this ISG starts with the training KSA list as the output. So it's an input to this program. So the output from the training program becomes an input to this program. And so they use this list as a starting point. And we would expect facilities to perform a screening to identify what tasks are important to safe operation or -- and/or related to the foundational theory of plant operations in order to develop the list that would include what items

would be tested on in an exam for licensing.

Depending on the original list you might add items as well as remove items. There might be things that are foundational that are important to test on, but because of the nature of them they screened out of needing to train on as part of the SAT process. Well, they would need to get added here. So this is why I kind of conceptualize it as like two separate lists. They're very much related. There are things that are going to be removed from the training list for the exam list and things that might get added to the exam list. So this section is one of the big parts of the section because this determines the entire content domain, the whole thing of what is going to be tested on the exam.

Next slide, please. So this slide basically just shows a little bit of a graphic that kind of describes the process steps that would go through and what's covered by this ISG versus what's covered by the Facility Training Program ISG. So you can see that your SAT tasks and task analysis is done under the training program. And then it's going to come into the exam program. And that's where they're going to do your defense-in-depth reviews, theoretical knowledge that maybe got screened out from the

training list maybe gets screened back in for the exam program list, additional reviews, screening what doesn't need to be tested because it's not important enough to safety, grouping them and then finalizing the list. Okay. That's it for Section 1 about developing the KSA list for the exam program.

Next slide, please. So Section 2 is all about developing the test plan. Basically now that you've got the list; that's great, how you are going to test it? And guidance is provided to staff related to what types of tests are most appropriate for the different kinds of knowledge or ability measured. As an example it talks about, hey, certain cognitive tasks are better tested on a written exam-type format versus other tasks might be better tested in a performance or simulation -- simulated performance-type format. And it kind of discusses the different kinds of cognitive tasks and things and what the more appropriate test measures are for them to help the staff evaluate whether or not those were applied by the facility in developing their exam program.

It also includes the format for the tests. So an example would be is the written exam a multiple choice, does it include matching, short answer, things like that?

It also has the content specification, the specific exam, the specific exam type cover. So what specific KSAs, what specific knowledge and ability statements are covered by a written? What specifically would get covered by say an oral board or a scenario GPM? How you're going to sample the KSAs for each exam. Say you have a list that's -- I'm just going to pull some numbers out of the hat. Say you have a list that's 500 knowledge, skills and abilities that would be sampled for the written exam. Well, how are you going to sample them? How do you group them to sample certain numbers or do you just sample out of the whole 500? So there's discussions about that as well as discussions on ensuring that -- how the test items get reviewed to make sure that they're clear quality questions and don't have other psychometric issues.

The staff's assumption is due to the diverse nature of KSAs that would be required to be tested. In other words, you have certain things that had cognitive requirements that would be better testing on say a written or oral test and some that would be better done through simulated performance. We would expect facilities to be developing a test plan that has multiple different test measures, or in

other words different types of tests. Like I said, written, scenario, et cetera.

Next slide, please. That was Section 2. So then Section 3 discusses exam validity. So just because they come up with an exam program doesn't mean that it's going to be acceptable. They have to basically prove it to us by describing how it is a valid test, which means that the test works the way it is intended. It's an accurate measure of the individual's competence or lack thereof. And so it discusses the different types -- the ISG discusses the different types of validity: content validity, concurrent validity, and what should be demonstrated in order to demonstrate that the exam program would provide for valid testing measures. And there are further discussions and definitions for what those validates are and the appropriate ways to demonstrate those.

Next slide, please. Section 4 talks about scoring specifications. In our ISG we state that exams are going to be criterion-referenced. That means that there is a score and you get above it or below it and you pass or you fail, basically what we do now. So it's not norm-referenced. There's no bell curves and the score changes, the passing score

changes depending on how folks perform. That's not considered appropriate for a licensing exam and so we define criterion-referenced in the ISG.

And one of the things we talk about is describing how each test item is scored and how you combine those scores to get to the total score. So for example, under NUREG-1021, our current process under Part 55, the written exam is a four-part multiple choice and every question is one point and only one point. And you add the points up to get to your total score.

For our current operating test we have the zero to three scale on the scenarios for each of the competencies and rating factors. And there's specific weighting that's done and you have to do these calculations to come up with the final score. So that's what we're talking about here is we need to have in the exam program a description of how the test item is scored and how they get those to get to a total score. And then the cutoff score. What is the passing score based on all of that?

Additionally if there is part of the exam that's based on score observation there needs to be steps described about how to eliminate any unconscious bias and judgments. So that's kind of like what we

have with JPMs and scenarios currently. There are critical steps or critical tasks. They get them or they don't get them. We try to make it as objective as we can so that you don't get that bias and judgments.

It's not a perfect example. The intent is to ensure that you have consistency in grading. So again, getting back to our mandate prescribing uniform conditions for operator licensing, for these facility-developed exam programs the underlying concept is what we're looking for to ensure the uniform conditions. Is what they're providing a consistent uniform reliable way to measure individuals' knowledge and ability such that only competent operators are licensed?

Next slide, please. Section 5 talks about reliability of the tests. So what's the difference between reliability and validity? Jesse just shared a quick quote with me which was very useful, but I'll paraphrase it. Validity is making sure that you're accurately determining whether someone's competent or not; reliability is being able to do so consistently. So they are related but slightly separate concepts.

So Section 5 talks about reliability of the tests, which basically means if the individual

were to repeat the test and managed to forget everything that was on the test in between taking the tests, that the result would be similar. So in other words, the test is reliable. Consistency. Stability of performance over time. And they have to provide documentation justifying the use of that test for operator licensing.

Next slide, please. Now all of this is stuff that is currently baked in the NUREG-1021, so the whole purpose of this is to allow folks -- the facilities the flexibility to determine what's needed for their plant designs, because what's in NUREG-1021 is very prescriptive and very much for large light water reactors. So a 100-question written exam might not be needed for a microreactor that has very few KSAs that would need to be tested in a written exam-type format. So this gives them the flexibility to tailor it.

Section 6.0 talks about the test manual. That is basically their equivalent to the NUREG-1021. It provides detail related to the specific types of tests as well as some administrative aspects to the tests. So we would expect them to include in this test manual how to administer the exam, the time allowed to take the exam, what test takers are allowed

to look at. Is it open reference, closed reference? Are they given certain materials like steam tables or something for the test? And then how to interpret the test results.

So these items -- there is additional guidance that would be expected to accompany each test that is actually developed. I might refer to that as test instance because there's a lot of test things talked about: test manuals, test plans, and what's what. Because there are items that can change from test to test those aren't things that would be appropriate to include in the test manual because the test manual is expected to be more stable, more like the NUREG-1021. So items that would be documented for the program as part of the test development process. There are also things that would be included with the documentation for each test.

So this documentation provides the licensing basis for operators so it's important to ensure it's complete and accurate. So the test, each test instance will include developers' names, when it was done, any revisions, evidence of validity, any information related to computer software if it was a test that used computer software. That's all provided as part of the basis for licensing operators. And

those would be expected to be developed for each test instance.

So Section 6, have to read it as both talking about test manual and what needs to be in that. That's kind of similar to like a NUREG-1021. And then it talks about things that would need to be included with each specific test that's developed or test instance developed. So that would be like test at facility A. Under NUREG-1021 it would have those items.

Next slide, please. So Section 7 is just some additional characteristics of high-quality test materials primarily focused on written and computer-based tests. And it gives some additional characteristics associated with psychometrics, test instructions, the scoring system, and standardization.

A key consideration for computer-based tests is adaptive scoring. If adaptive scoring is proposed there would need to be some kind of justification as to how uniform conditions are still being met for the individuals taking the test. So that's that.

I think there's a hand raised. Vicki?

MEMBER BIER: Yes, thank you. This is Vicki Bier. I just have a quick question about who

would ordinarily be developing these tests, especially at facilities that may have very small staffing. Because as an educator myself I know that you can be very expert on the material but not knowledgeable about how to create reliable tests. And I've seen plenty of tests that are -- with questions that are easily subject to misinterpretation, where somebody who knows the material could get it wrong for weird reasons. So anyway, I'm just curious what's envisioned especially at small facilities that may not have like a dedicated training staff or whatever.

MS. BUCHANAN: That's a great question, Vicki, and I'll let Jesse jump in here in a minute. I'll go ahead and give my response, but I'm sure Jesse will have some thoughts as well.

And I agree with. I vividly remember being back in college and taking some exams where the instructors were very knowledgeable in the subject matter, but their exams were just terrible. And so I totally understand that point and get it.

And my understanding is that the expectation is in the development of this test manual it will require the use of folks who are both subject matter experts in the field; so on that design type, as well as subject matter experts in the area of

testing and measuring. And that's to develop the program. So the program that would come to us for review.

Part of the program would include how the folks are qualified, and so that would -- that is where I would see whatever would be required for exam authors. That would get covered under the -- I think that would get covered more under the Training Program ISG than is covered under this ISG. But the expectation is that there would be some level of qualification for the exam authors to make sure that they could write exams that are psychometrically sound. I will as for the -- I'm taking a quick step back -- for the specifically licensed operators we both review and approve the program overall, but then we also review and approve each test instance before it's given. So there is a backstop for the specifically licensed operators where the NRC would have to say yes, you're right, this is psychometrically sound.

For the generically licensed operators we still do a review and approval of the test program, which would include all of these requirements I'm discussing here. And then for the test itself we'd be doing more of like what we do with re-qualification

now where we go out and do inspections and we say are the tests that they're writing psychometrically sound or not? And if they're not, then there's violations and things that -- the findings that they can get. So there's some regulatory pathways that we can follow.

But, Jesse, I didn't know if you had anything you wanted to add onto that?

MR. SEYMOUR: Yes, thanks, Theresa.

And this is a place where it's a great concern, it's a place where we end up striking this balance between flexibilities and I think some of those pragmatic realities, what happens when you have facilities with small staffs.

So in terms of different ways that this program could be developed we've contemplated that in some cases it may be the owner-operator develops the program them self, right? We've envisioned that it's possible that the owner-operator may contract an entity to come in and develop the program with the understanding that that initial development would take more resources than the ongoing administration of that program once it's up and running.

Another thing that we've envisioned is that some of the vendors may potentially elect to run that program centrally, right, to basically kind of

package that with their product line to go ahead and do that as well, too.

So again, these are different variations. The paradigm that we see in the existing fleets is that the owner-operators will run those programs a resource perspective. And again, keeping in mind that this is using an established program. Typically what we see is that there's a single exam author that works on the exam projects and keeps that stuff going. They'll pull in additional subject matter experts as needed for validation purposes and things of that nature, but generally it's like a one-person kind of full-time project to run through that. So that's historically what we see.

The other thing, too, that I'll add is that what Theresa and I have tried to be very deliberate with in this guidance is to -- and, Theresa, forgive me, I'll use the term -- sometimes we refer to it as the easy button. What we try to do is allow for the flexibility for facilities to go through and to really craft the exam methods that are used to suit their specific needs. However, what we try to do as well is to leave the door open, that if a plant just wants to emulate the methodologies of NUREG-1021, the established methodologies, that they can really

pick those up and run with them. Again with the review itself that we do accepting that this is a known process that it will work well over time. And versus going through and reinventing things they can just run with that.

Now granted there are pros and cons to doing that, but we try to leave that door open that if the resources aren't there are if the facility applicant/licensee doesn't want to put those resources there, they can elect to adapt wholesale significant portions of the NUREG-1021 process and sidestep a lot of this kind of deep psychometric and assessment testing work that would have to be done.

MEMBER BIER: So I actually like the model. I mean obviously it's not up to us to dictate what the model will be, but I like the model of the vendor possibly providing testing materials or testing program information because I can kind of envision that at small unique facilities there may not be somebody on staff who's knowledgeable how to write good tests. And at the same time if you look at the world of training consultants, there may not be a lot of people who are knowledgeable the specifics of that facility design. And the vendor would kind of bring both, I would hope, but that's a good option at least

to have in mind. Thank you.

MS. BUCHANAN: Thanks, Vicki. And that actually was one of our main considerations when we were drafting this was to give that flexibility because we thought that would be folks who would use that as almost like an economy of scale, have the vendor do it so that the individual facilities might be too small to be able to have the full-time staff. So that's one of our thoughts.

Jesse, did you have something else you wanted to add before I move on?

MR. SEYMOUR: No, I was just going to add on that at the end of the day it kind of gets back to what I said before, that we have a very distinct role and our role is not to come up with a business case that they should be using. But what we try to do is think through what those business cases might be and where things are acceptable, just to least those flexibilities open. So again, we try to leave a door open to going about it like this or that. And in the end it will have to be a decision that's made by that entity on how they want to approach it. We just want to leave those flexibilities there for them so they can select them.

MR. BLEY: This is Dennis Bley again.

Have you had any conversations with EPRI or NEI or other industry groups? They've been involved helping set up owners' groups and that sort of thing that work in these areas as well as in the engineering areas. But is there any hints of what's going on on that side of this process?

MR. SEYMOUR: Theresa, I can speak to that, if you want me to.

MS. BUCHANAN: Okay.

MR. SEYMOUR: Okay.

MS. BUCHANAN: Yes, please. I'm not really aware of any. I know that this ISG is pretty new on the street. It only came out last month, so I don't know that they've had a lot of time to really digest everything that's in there.

But yes, Jesse, if you know something.

MR. BLEY: Well, was it all developed in house or -- sometimes those kind of ISGs you cooperate with EPRI and NEI in their development. It doesn't sound like that was the case here.

MS. BUCHANAN: We work primarily with INL. Jesse?

MR. SEYMOUR: Oh, yeah. Sorry, Theresa. Yes. So, and I'll start with that point. So the way that this guidance was developed, for the guidance

documents that we're discussing today, only the staffing guidance was developed exclusively in-house.

And what we did with, you know, the human factors engineering guidance is we worked with Brookhaven National Lab. And with the operating licensing guidance we're discussing here, we worked with Idaho National Lab. Now, Idaho National Lab, you know, also, you know, worked in tandem with individuals from Embry-Riddle Aeronautical University with those.

So, specifically, you know, we had, you know, academics involved. And notably, one of the key subcontractors was actually someone who had experience with, you know, the pilot certification testing that's done by the FAA, if I remember right. So we tried to reach out to other entities that were involved in assessment testing of people that were, you know, involved in, you know, applications where safety was involved.

And so, beyond just, you know, the kind of a contracted staff, one of the things that we did as part of this development project is we actually had a workshop that we hosted over I believe it was a two-day span. And for that workshop, we actually invited and we had attendance by a very wide range of

individuals.

So we had international attendees, you know, like Finland, for example, as I recall correctly, you know, talking about how they approach, you know, their programs. We had an individual from, you know, the Federal Railroad Administration talking about how railroad engineers and conductors are, you know, certified, right, the regulatory requirements that are there. We had individuals from aviation. We had, you know, individuals involved in other aspects of training.

And the key audience that we targeted for that were, you know, instances where there was some sort of a regulated or required certification process that people were going through. And it was to let them do a job where there would be safety impact, because we wanted to get a very broad survey of how that was being approached.

And in the course of doing that survey, we pulled in information, even in that level, what the passing scores were, you know. And, you know, so I'm looking at, you know, like how do you figure out what the test, what methods do you use to test, you know, what are the passing scores, what are the technologies, you know, for entities.

Then I'll give the example of the Federal Railroad Administration, you know, getting into the, you know, where does the government, you know -- you basically say, okay, we're going to regulate things down to this level in terms of how this process works. Actually, a lot of good synergy as we noticed there between how they were approaching things and how we were looking to as well, too.

You know, we had a retired individual from the Federal Aviation Administration, if I remember right, you know, talking about how they approached things as well. So, again, you know, we pulled in a very broad range of information in putting those together.

And something that, you know, something that we found to be quite interesting as we did this was not only did you get into matters of, you know, where there was established science, if you will, right, in terms of, you know, assessment testing and things that are very well established, you know, again, you know, things like the concepts of validity and reliability, you know, content domain, those types of things, but also where, you know, we found that fairly universally certain things are just left to subject matter experts, elicitation and consensus,

right.

So there's a number of end points here where, you know, if you really ask a question of how do we scientifically figure out what a passing score needs to be, you're not really going to get a clean answer on that, because it's going to come down to what subject matter experts and incumbents in that field reach a consensus on as to where that performance cutoff is, right.

So, again, you know, there's a place where, you know, kind of the science and the art come together on something we learned here, too. So, as we shape the guidance, we tried to be mindful to where things really need to fall back on the subject matter experts for, you know, for that new technology.

Now, the last thing I want to touch upon is the working groups. And, you know, we have had interactions, you know, recently with entities, yeah, individuals from NEI, you know, our, you know, interactions with NPO, right, that we have, you know, have our, you know, we meet with them annually and so on and so forth under a memorandum of agreement.

And what I can say is that there's other working group efforts that are, you know, other, you know, similar or kind of tangentially related to, you

know, what's going on here. But for the purposes of developing this guidance, again, you know, the pool of information that we drew from was what I described.

And again, what we intend to do is, you know, last week we had a stakeholder meeting, right, where we presented very similar presentations on these interim staff guidance documents. And we've made those publicly available, and again, to get those out to the stakeholders.

And what we anticipate going forward is that, since these are included in the Part 53 rule package, when we get into the public comment period that, you know, that the public will not have had time but the stakeholders will have had time with those efforts that they're, you know, doing individually and so forth to go through to consider what's here and to make informed comments on this and refine what we're doing.

Theresa, that's all I have.

MS. BUCHANAN: Thanks, Jesse. Yeah, I think the key point is this is still a draft guidance, so it was going to be subject to change. So we do expect to get comments from NEI and those folks on this guidance. All right. If there's nothing else, can we go to the next slide, please?

So Section 8 basically is a very short section. It just references back to items in NUREG-1021 that are universally applicable. So that really related to plant designs, so, for example, things like exam security or whether or not procedures are going to get frozen or overview of certain generic examination concepts.

You know, there's discussion. You know, Appendix A of NUREG-1021 talks about, you know, the generic exam, you know, concepts. And it includes an additional discussion on validity and reliability and things like that.

So, basically, what we say in the ISG is that's all stuff that's universally applicable to examination programs since it's not really related to a specific plant design. So, instead of just copying and pasting everything from the NUREG into this ISG, we just reference it back to the NUREG. Next slide, please.

So Section 9, this is the slide that we had mentioned earlier. It talks about simulation facilities. This is primarily associated to simulation facilities used for the exams. So there -- and I'm sure Jesse or Maurin could talk about it. There's different requirements for simulation

facilities used for the HFE testing stuff. That's not in -- that's beyond the scope of this ISG.

This ISG is related to, if you're going to use a simulation facility on the exam, it has to have sufficient level of fidelity in order to assess those KSAs. I mean, that just makes sense. You would think that would be what you need to do. So, but we put it in here to make sure it's in writing.

So they have to show how, if they're going to be testing things on a simulation facility, let's say they're going to be doing JPMs as an example, they have to show how the simulation facility can actually test those JPMs and have an appropriate level of fidelity so you're not getting into like negative training and stuff.

Additionally, the simulation facility should have the same cognitive requirement as the real environment, so glass top to glass top, actual hardware to hardware, so similar cognitive requirements.

And if you have a simulation based assessment, again, just like other assessments, you have to have documentation on how that exam is valid.

That documentation would include what's measured, who the intended population is here --

that's fairly obvious, that would be the operators or the applicants -- what the measurement tools are, and includes things like identifying the jobs and tasks, the specific scenario events, identifying metrics, in other words, how you determine whether or not the examinee achieved the objective, if they passed or not, so what are the metrics, and additionally, just feedback to the examinee on their performance.

So that's basically what this covers here. And again, like I said, this covers simulation facilities in the context of the exam program, since that's what this ISG is primarily about. So it does not cover simulation facilities from the context of like HFE testing. Next slide, please.

So Section 10 now gets into administration of the operating tests. Now, currently under Part 55, we administer all the operating tests. So the NRC does it. Under Part 53, we're looking at allowing the facilities to administer operating tests while we do inspection to make sure that they're administering them correctly.

Regardless, the examination program needs to have documentation and procedures similar to those in NUREG-1021, specific to the type of test administered, to ensure that examiners behave in

accordance with the appropriate codes of conduct to ensure exam integrity.

Again, examination integrity is still, you know, a requirement under Part 53. So they need to have measures in place in their program to ensure that, so, when administering these tests and also measures in place to retain required records associated with the administration of these tests.

Again, these tests help form the licensing basis for licensing these operators regardless of whether you're specifically licensed or generally licensed. And so the records need to be maintained.

But this is, administering the operating tests is based on what you have in your operating tests. So, if you have no JPMs, you don't need to have instructions on how to administer JPMs. You really only need to have instructions on how to administer the aspects that are associated with the facility's developed exam program.

So, if no scenarios, there's no instructions on how to administer scenarios. But if there are scenarios, you have to have instructions on how you administer the scenarios and make sure that you're retaining exam security. All right. Next slide, please.

Section 11 then covers the change management process for the program. The programs that are required to be reviewed and approved by the NRC also are required to have some kind of change management program, so what changes can be made that the facility can make without having to come back to the NRC and say, hey, we've made changes, you might need to look at this, and what changes do require us to come and take another look at it and say, okay, the changes you've made are okay, you haven't significantly changed the program or you haven't changed the program in a way that would impact the exam program or make the license decisions invalid.

So here are some of the examples, you know, exemption from regulation, changing tech specs, and then the last two is the negative impact to exam security or integrity or a negative impact on the consistency of the reliable, valid measure of the exam.

An example is also provided in the ISG. It's something that people might not originally think of as a problem with adding it, you know, why would you need to get NRC approval, and that's adding knowledge, skills, and abilities to the exam list. So you're going to be testing on additional things.

So that's like, okay, well, that should be fine. But you have to think beyond just adding something to the testing pool. You have to think about the, you know, unintended consequences of that, you know. It could have a broader impact on the exam.

So questions that would need to be addressed is should sampling be changed, do I now need to sample more from this area versus this other area, do I need to increase the number of my test items. If I had a 500 KSA bank and let's say I added, you know, I added a new system, so I added 20, 25, 50 KSAs, well, now I have a bigger bank, you know. Do I need to add questions now to my exam? Maybe my exam was 35 questions before. Maybe now it needs to be 40 or 50 questions.

So these are all things that -- just adding items to the exam list has broader impacts than just that list. And so that's an example of something that would still need to be reviewed by the NRC to ensure that all the potential impacts of the change are properly considered prior to proceeding.

So the exam program itself that they would submit to us for review and approval would have within it how they propose to do the change management, what things we would need to review and approve before

doing and what things the facility could do. We provide a list of both in the ISGs that would be acceptable.

An example for the items that they wouldn't need to come back to us on are things like, you know, minor edits for clarity where they're not really changing anything, they're just clarifying things, stuff like that. So that's all in this section of the ISG. Next slide, please.

MEMBER BIER: Excuse me. Another question. Vicki Bier.

I appreciate the idea that adding items or skills and knowledge to the test bank could require NRC approval for the reasons you stated. But I also wonder whether that creates a disincentive for the licensee to add items when it might be advisable, because they may say, well, but then we're going to have to go through this whole NRC approval, maybe we should just leave those items off and not add them.

MS. BUCHANAN: Now, that's a good point. And, you know, my initial response is going to be, well, the SAT process will catch you. But the SAT process is associated with training and not necessarily the exam.

So that might be something that we would

need to take a look at to make sure that there's a feedback loop, if you will, kind of like, you know, how SAT process has that feedback loop where if you identify something new that needs to be added to training you get a start back in on your SAT process to, you know, do the task analysis and all of that kind of stuff.

So it kind of has this iterative, constantly iterative approach of saying, hey, do I need to add new things to my training program. And I don't think we really have that right now in the exam program. I don't know, Jesse, if you wanted to touch in. But that is something that I think maybe we should consider.

MR. SEYMOUR: Yes, Theresa, yeah. You know, the systematic approach to training is a living process, right. So, again, we mentioned that, you know, there's another layer to, you know, the equation here. And that's the broader, you know, training program review guidance.

And, you know, the training program review guidance, which is, you know, a separate guidance document that we're working through, that really has to be balanced against the potential that, you know, some entities may elect to pursue accreditation of

their training programs, right. And historically where, you know, accreditation has been achieved, you know, that's been seen as an acceptable way to meet some of those programmatic requirements. So the depth to which we look at those programs could vary depending on the approach taken.

But the bottom line is that that's a living program, right. So, as, you know, as you make modifications to your facility, right, as you do things that, you know, change tasks that need to be done, right, that gets caught up in the analysis phase, right. It would be a task analysis.

And that subsequently translate to determining, you know, training needs, right, so identifying learning objectives and so forth. So that's really an upstream process.

Downstream of that you have, you know, kind of this, you know, testable body of those knowledge and ability items, you know, that they did out of the task analysis that are of a high enough importance, you know, to warrant, you know, testing within the scope of these examinations.

So, for the, you know, for the entity to just say like, well, hey, we're going to forego, you know, making this change because we don't want to go

through that, right, again, that's something that we don't want to, you know, inadvertently get things into that position.

So what we've been trying to do is strike a balance between letting that SAT process be a living process where, you know, the learning objectives and so forth are, you know, updated and refreshed as they need to be based upon changes to tasking, but at the same time, allowing, you know, the knowledge and ability list to undergo, you know, reasonable modifications and updates, right, you know, in tandem with that, but again, you know, trying to set, you know, the boundaries to where those changes become of a, you know, nature that's substantive enough, you know, for us to have to, you know, provide approval.

And really it's when that balance starts to get thrown off. And, you know, and I think Theresa touched upon that, you know. You can really go in two different ways.

I'll give an example. So, you know, one of the things that we need to avoid is the potential for a facility to do too shallow of a task analysis, right. So they could come in and they could say, well, you know, the operator is simply someone who implements. They push buttons. They don't need to

know the theory, the system operation, and so forth. They simply pick up procedures, see light, push button, right. And that's a gross oversimplification, but that's it, right.

So, you know, a proper, a properly rigorous, you know, SAT based process that, you know, again, you know, descends into, you know, this knowledge and ability catalog of testable items would look at, you know, the full scope of, you know, the cognitive aspects as well, right. So, and again, you know, in our guidance, you know, if not here, over in the training guidance, we do matters of like cognitive task analysis, right.

So you have to have the underlying understanding, you know, from the fundamentals on up, you know, regarding those. And that's something in the preamble that we talk about more, you know, what the, you know, what we envision the required minimum scope to be.

So, as, you know, as this process goes through, there is the peril, you know, that we have to safeguard against that there could be an inappropriate change in the perceived job task scope that's allowed to translate down to, you know, that list of KAs, right. So someone could, you know, narrow the scope

in an inappropriate way, and it starts coming out in things like fundamentals and systems.

And then on the other end, right, and I think Theresa spoke to this, you know, as you incorporate these modifications into the plants, right, now, at the level of just the training program, of course, those tasks should be included in training, right, and so on and so forth.

However, when it comes time for the license exam, you know, again, we want to keep the focus there on, you know, the safety functions, the important administrative functions, you know, the control reactivity, right, you know, that kind of, you know, pool of things that are evaluated to be of higher importance, right, for the job role.

And so what we don't want to do is dilute that pool, right. So, again, you know, we don't want to, you know, necessarily be testing, you know, some ventilation system that's out in the field that's just installed for comfort, right. That's not something that should be showing up on the license exam.

So, again, it's a difficult balance to strike. And what we, you know, absolutely want to avoid is what you're pointing to, where somehow we disincentivize, you know, the facility from, you know,

being able to take this, you know, this very, you know, kind of honest, forthright approach, and, you know, just updating things in real time as they're warranted, right, and then stalling modifications that are prudent. So --

MS. BUCHANAN: Jesse, I just want to just tag on a point that I think that Vicki was making, and, please, Vicki, correct me I get this wrong.

But I think the point that I was hearing is, you know, the way that our ISG is currently written, it's kind of static. So the training program based on being SAT is, indeed, iterative, continuous, life cycling, however you want to call it. But the way that the exam program is currently written, other than for the section on making changes to it, it's kind of static.

So, having a change to your training program, I don't currently see in our ISG, and maybe I'm wrong, but I don't currently see in our ISG a kicker that says, hey, when your training list changes, you need to go back through and redo the exam program KSA list.

And I think that's what Vicki was kind of asking, saying, hey, is there something that kicks in into doing that, because if they have this change

management and they're disincentivized from doing that, they're not going to want to do that unless they're being made to do that.

MEMBER BIER: So I will just say, you know, I appreciate that it's a difficult balance, right. If you mandate too many things, then you can get just kind of compliance by checklist and somebody mindlessly trying to fill all the requirements. And on the other hand, if you have too few requirements, then, you know, people can skate by and, you know, not take certain things seriously that they should.

So I don't think there's necessarily a right or wrong place to fall on that, but just that that idea of are we inadvertently disincentivizing licensees from adding things to the list of testable items. So --

MS. BUCHANAN: Good point, yeah. All right. Can we go ahead to the next slide, please?

CHAIR PETTI: Yeah, just, members, I'm hoping that we'll take a break after this presentation --

MS. BUCHANAN: Yeah. I've got five slides left, so I'll try and get through them as quickly as I can.

CHAIR PETTI: Great. Thanks.

MS. BUCHANAN: Thanks. Okay. So Section 12 is on static, computer based testing. Basically, we just say, hey, that's beyond the scope for right now. But if they wanted, if the facility wanted to do that, they'd have to provide documentation to describe how that's equivalent to what we do have in the ISG. Next slide, please.

This section provides some additional guidance on requalification. As Jesse had mentioned, this does specify the fact that, hey, if you fail, you have to get remediated and retested before returning to licensed duties. And we would expect to see that in their program.

Periodicity, when I'm talking about periodicity, I'm talking about the length of time that the requalification program cycle runs. And for specifically licensed ROs and SROs, it's the same as what we have for Part 55, don't exceed 24 months.

For the generally licensed operators, we allow the facility to define that. But if they're going over 24 months, then they have to provide a basis for why that's okay. And we provide some examples. So we say that includes things like the SAT process, operator performance trends, industry OE, changes in the experience level or turnover of the

staffing, significant changes to design and operation of the facility.

So this periodicity is defined by the program. But based on, as I said, some of the examples we provided, there is a possibility that that periodicity could actually change throughout the life cycle of the facility. And it's going to be defined by the program for the generally licensed operators. Next slide, please.

Proficiency, again, I've already previously mentioned that. That has to do with actively performing the functions of a licensed operator. And you have to maintain it and instructions for how to reestablish proficiency that cannot be maintained.

Basically, the difference is current Part 55 operators is currently defined in regulation. And the difference here is that the facility can define what it is for their facility. But it has to get reviewed and approved by the NRC first.

So it's a little bit less proscriptive. Like currently you have to have, you know, 5, like 5, you know, 5 day, you know, 5 days, 12-hour shift within every calendar quarter in order to maintain your proficiency. And if you don't, you have to do

all of these 40 hours under instruction with a complete plant tour and all these other things. And so we expect them to define that for their facilities. Next slide, please.

Okay. Section 15 talks about waivers. When I'm talking about waivers, what I'm talking about here is waiving the requirements for the exams. So, under -- and Jesse you know the rule language a lot better than I do. I don't know the specific one.

But for specifically licensed operators, it's in the rule about being able to waive the requirement for an exam. And if I remember correctly, and I could be wrong here, Jesse, correct me if I am, it's similar to what we have currently for Part 55 operators in that, you know, there is criteria that can be met that allows folks to request a waiver from the exam.

So an example, they were licensed at that facility. They left. They come back a year later. You know, they get refreshed on changes that have been made. And then they put in a request to us under Part 55, I think it's 55.47, to say, hey, I want to get relicensed at this facility, but I don't want to have to take the exam, and here's how I meet the waiver requirements that's listed in the rule.

So it's a similar process for the specifically licensed operators. That's why there's no information on that in this ISG. There doesn't need to be. It's in the rule itself.

For the generally licensed operators, there isn't any information in the rule specifically on the exam piece of it. So they said, hey, if they have appropriate criteria similar to what's in 55.47, especially, that says, hey, if, as a generally licensed operator, if you were generally licensed, you know, at this facility and you meet these requirements, you don't need to take the exam in order to get relicensed at the facility.

If they want to propose alternate criteria, then we'd have to review that. And they'd have to establish a basis describing how the criteria they are proposing ensures that the individuals are going to be able to safely and confidently operate the facility without having to pass another test.

MEMBER HALNON: So this is Greg. Just real quick, this goes back to my comment about the NRC having a point in this process to validate or verify that operators have completed everything they need to do before they assume licensed duties.

And this is another case where the

licensee can waive the requirements either through, you know, very diligent compliance with the program that you guys have already approved, or as we know could happen, wordsmith is such that somebody who may be marginal meets the criteria for a waiver. And there's no check and balance by the NRC anywhere before this person becomes licensed.

And I just think that this is another case where the fox has the key to the hen house in some respects. And it further validates why I think there should be a point where the NRC verifies and validates all the criteria met prior to licensed duties.

MR. SEYMOUR: Theresa, I can speak to this if you want to --

MS. BUCHANAN: Okay.

MR. SEYMOUR: -- yield the floor for a moment. So --

MS. BUCHANAN: I yield the floor to you for two minutes. I'm going to time it.

MR. SEYMOUR: Thank you. I appreciate it. You know, and again, I captured the point earlier on this. It's a really good point. Like I said, you know, it's something that we will, you know, definitely, you know, consider further between now and the full committee.

What I can say is that, you know, there are certain legal ramifications that we get into of, you know, a general license and some of the mechanisms that are in fault there. And there are some practical considerations associated with that.

So what I wanted to point out, though, is that in, you know, in some aspects, right, you know, there's still enforcement action, you know, potential, right, in some instances. Whereas, previously we might have been in a circumstance where we'd be taking two enforcement actions against both the individual licensee and the facility licensee, which is quite common in issues that happen with individual operator licensing, right, specific operator licensing. We'll actually issue violations against both in some cases.

What we would have here is a circumstance where, you know, if we had an entity that, you know, came in, you know, said here's the waiver process that we'll use, presented something to us that, you know, for the sake of discussion we'll say emulates, you know, the structure of 55.47, and then inappropriately applied that, right, well, we have every intention of, you know, having, you know, ongoing inspection activities of these programs, right.

Then again, that's a program that still

needs to be flushed out, you know. It will be part of the broader inspection methodology that's crafted for Part 53.

But our intention, and, you know, I think this is articulated in the preamble as well, is to, you know, have an ongoing oversight of these programs, so, you know, via, you know, regular inspection or via reactive inspections, right, you know, again, post-event type of circumstances.

If it came to light that there was an inappropriate application of that process, again, you know, this would be an approved program. And again, there would be, you know, the potential there to take enforcement action against the facility licensee.

Now, that's an after the fact thing. It doesn't address, you know, your concern about how do you address this on the front end.

However, what it does is it creates, you know, a factor that should act as a deterrent against, you know, that type of inappropriate, you know, implementation of these programs, right, because again, there is the potential there for enforcement action and, you know, everything that's attendant with that. So, again, I would just offer that.

In some cases, with the general licensed

reactor operator program, the onus has shifted, you know, versus just going away entirely, right. So here is an area where, you know, the regulatory hook, you know, is still with the facility licensee.

So, again, it's on us to review that program and to make sure that it's appropriate before we accept it. However, they will be on the hook to implement it, you know, and it will be something that we envision as being enforceable.

MEMBER HALNON: Yeah, I agree. There is a level of comfort with the inspection program.

However, what we told you prior to this and we reiterated it to the Commissioners during our briefing is that the ability to assume licensed duties by being a licensed operator is a really big deal, and we want to keep that in front of us as being a really big deal. And part of that is make sure that the federal government agrees that that person is as qualified as the licensee says they are.

So, but I do agree, Jesse. There is a level of comfort that there is both enforcement hanging over people, as well as you assume that everyone is diligently and incredibly complying with the program that you have already approved. So, again, that's just, again, back to my original

comment, I think there should be still a verification of, prior to assuming licensed duties.

MS. BUCHANAN: And, Jesse, you said you'd noted that down already?

MR. SEYMOUR: Yes.

MS. BUCHANAN: Okay. All right. Then I'm not going to write it down a second time since you've got it. Okay. Thank you, Gregory.

If we can go on to the next slide, this is my last slide. So everybody can get excited. So this is -- Appendix A to the ISG talks about currently approved examination methods. Basically, what it says is this is that easy button Jesse talked about. He stole my thunder earlier.

So, if you have methods that are currently approved in NUREG-1021, you can go ahead and use them without needing to provide any further basis for their use or us having to do any additional NRC review, because we basically looked at it as, hey, this is something that's already been reviewed and approved.

So, in other words, if you want to use a four-part multiple choice written exam with an 80 percent cut score, you don't have to provide a basis to us on why a four-part multiple choice written exam with an 80 percent cut score is okay.

You would still need to have a basis for which KSAs are being tested using this method, the sampling method that's being used for it, and as well as the number of questions on the exam if you're not doing a 100-question exam. All of those aspects would still need to be justified.

But, you know, the fact that you had a four-part multiple choice, you know, format with an 80 percent passing rate, that wouldn't need to be justified. You could just use that as is because it's basically been previously approved by the NRC by virtue of being in NUREG-1021 currently. That's how we kind of looked at that.

And that is that. That's all that I've got for my presentation. And I know that it was said that you all wanted to look at doing a break. So I was aiming to get done by 11:00, and I managed to do that. So I don't think I made up all the time that we lost earlier, but I think I made up a little bit.

CHAIR PETTI: Great. Thanks. Any other comments, members? Okay. Then let's take a 20-minute break, come back at 20 minutes after the hour. 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. We're back. So let's keep on going. Thank you.

MS. SCHEETZ: All right. Good morning, subcommittee. This is Maurin Scheetz. I'm an operator licensing examiner and technical reviewer in the NRC's Operator Licensing and Human Factors Branch.

Now I'm going to present on the draft guidance for NRC review staffing plans under the proposed Part 53 rule. This interim staff guidance augments existing staff guidance in NUREG-1791 which is titled Guidance for Assessing Exemption Requests from the Nuclear Power Plant License Operator Staffing Requirements Specified in 10 CFR 50.54(m). It's augmenting this NUREG so that it can be used to review staffing plans submitted under Part 53. Next slide, please.

So this slide explains why we wrote the draft review guidance to augment NUREG-1791. The current staffing requirement for licensing Part 50.52 plants is very prescriptive, and it's specifically written for up to three large light water reactor units. The NRC can review exemptions to this prescriptive staffing level using NUREG-1791.

NUREG-1791 was developed in 2005 in

anticipation of advanced reactors and an increased use of advanced automation. And it provides a performance-based process for determining an appropriate number of control room operators. It has 11 steps, including the review of a staffing plan validation.

The staffing plan validation itself is a performance-based test used to determine whether the staffing plan meets performance requirements and acceptably supports safe operation of the plant. The staff used NUREG-1791 most recently to evaluate the novel control room staffing models for the NuScale small modular reactor design. So we are very familiar with use of this review guidance.

However, NUREG-1791 cannot be used as written for Part 53 purposes because it relies on the exemption process, the exemptions to Part 50 requirements. So because of this, we chose to augment the document for Part 53 purposes. Next slide, please. So the next few slides provide an overview of the Part 53 approach to staffing from the proposed rule language.

The staffing rule in Part 53 is flexible meaning that the applicant proposes a minimum staffing level by submitting a staffing plan with their

application. The rule considers differences in staffing needs when operators have or do not have a safety rule. If the applicant is going to use specifically licensed operators, then the applicant must provide additional details in their staff plan submittal, and those details must be supported by human factors, engineering, analysis, and assessments.

We also recognize that operators may fill multiple roles at the plant. So the staffing plan submittal has to include information about other responsibilities the operators may have. The staff will review and approve the staffing plan as part of the licensing process.

Subsequent changes to approving staffing plans are then subject to administrative controls. Next slide, please. So this is the main excerpt from Part 53.730(f) for the applicant to submit a staffing plan. And that staffing plan focus is on the number, positions, and qualifications of operators, either specific or generally licensed across all modes of plant operations and a description of how the numbers, positions, and responsibilities of personnel in the staffing plan would adequately support all necessary functions in the areas of plant operations, maintenance, radiological protection, chemistry, fire

brigade, engineering, security, and emergency response. Next slide, please.

The staffing plan must also include a description of how engineering expertise will be available to the on shift crew during all plant conditions to assist in situations not covered by procedures or training. This is at least one person available to support the crew at all times. And this person must be familiar with the operation of the facility and have a technical degree or a professional engineer license.

These are the same education requirements that exist for shift technical advisors or STAs at operating reactors. However the requirement for engineering expertise is different than the traditional STA because it allows for more flexibility and where this person is located to do their job. They could be onsite or offsite, and it could be a single qualified individual providing coverage for multiple facilities from offsite.

The overall purpose of this position is also slightly different than the STA. The initial purpose of the STA immediately following the accident at Three Mile Island 2 was to provide additional technical and analytical support and advise the shift

supervisor on actions to terminate or mitigate the consequences of abnormal events or accident conditions. The Part 53 requirement for engineering expertise is focused on supporting the crew in situations not covered by procedures or training, also known as uncertainties.

It's aligned with Commission policy for education on shift as described in the 1989 Commission policy statement titled Education for Senior Reactor Operators and Shift Supervisors at Nuclear Power Plants in which the Commission acknowledged the potential for situations to arise which are not covered through training or operating procedures. And therefore, there's a need for some individuals on each nuclear power plant shift who have an innate understanding of systems level performance of a nuclear power plant and knowledge of scientific and engineering fundamentals and basic scientific principles that govern the behavior of electrical, mechanical, and other engineering systems. Education and experience requirements for candidates for operator licenses are traditionally dictated by a facility license's training program requirements.

Specifically, reactor operator candidates must have a high school diploma. And senior reactor

operator candidates without previous experience as a reactor operator on a commercial or military reactor must have a bachelor's of science degree or equivalent in engineering or engineering technology or related science with some exceptions. This allows for the control room operating crew to have a desirable mix of education and experience requirements -- sorry, a mix of education and experience backgrounds such as senior reactor operators with technical degrees and reactor operators with substantial hands on engineering -- sorry, hands on operating experience.

The staff anticipates that Part 53 applicants may seek alternatives to these traditional categories of engineering and experience requirements for operators. So the requirement for engineering expertise ensures that at least one person is available to provide an engineer's level of understanding for potential confusing or unclear plant parameters or response. Next slide, please. So this slide goes more into an overview of the draft interim staff guidance for reviewing Part 53 staffing plans.

So the objective of the staff guidance is to guide the reviewer through a process of evaluating staffing plans, their supporting analyses, and determine whether the proposed minimum staffing level

provides assurance that plant safety functions could be maintained across all modes of plant operations. It's intended for plants to have specifically licensed operators. However, we do believe we could scale the review using this guidance for plants with generally licensed operators.

We are still trying to decide what we're going to do with those generally licensed operator staffing plants. This ISG is intended to be used in conjunction with NUREG-1791. So you have to have both of the documents open.

And it follows the same 11 steps with some review criteria added or removed. For example, it includes review guidance for this engineering expertise requirement that's new to Part 53. And I'm going to show that next.

Though it's developed as an interim staff guide, we believe that once we have some experience using it, we can update the parent document, NUREG-1791, to include this guidance. Next slide, please. So this is my last slide. And I know that the Committee wanted to specifically look at what kind of criteria we were going to use for review of the new engineering expertise requirement.

So step 7.3 of our ISG addresses how the

staff will review the applicant's method to meet this proposed engineering expertise requirement. There's review criterion --- there is a review criterion to accompany each of the bullets on the slide for this list of high level things we're going to look at. For example, regarding training and qualification, the training and qualification program for the person fulfilling the engineering expertise requirement must be derived from a systems approach to training.

The review guidance has the reviewer look for a minimum set of training subjects for the initial training of that engineer such as generic fundamentals, plant systems, operating procedures and their bases, analysis of transient events and accidents, core damage, and others. An example of data needs and offsite response time, if the engineer is going to be located offsite, personnel fulfilling the engineering expertise requirement have access to the same suite of displays or a similar set of data that's available to the on shift crew. And then we have in there that they have to be able to respond to requests for assistance in a timely manner not to exceed ten minutes.

If the engineer is going to be located onsite, same ten minute requirement. They have to

show up in the location of the on shift crew to provide technical assistance within ten minutes. So those are just some examples of the more specific criteria we're going to look for when we're looking at this overall engineering expertise requirement and how the applicant is meeting it. So this is the last slide I have regarding the staffing ISG. I can take questions now.

MEMBER BIER: Hi, this is Vicki Bier again. I'm going to reprise Charlie's question from earlier today about how do you know that offsite engineering expertise will, in fact, have access to the plant information electronically given the various disruptions, whether it's cyber attacks or just outages, et cetera, that could impair that.

MS. SCHEETZ: Okay. So there will be some cyber security expectations for this data transfer, also some expectations for data refresh date. That's written in the guidance. So those are things we're going to look at.

We're also going to have them demonstrate -- one of the expectations is demonstrating this rule in the validation activities. So we are looking for those kind of things. I mean, maybe we look for a backup plan if they lose all communications. But they

have to have some kind of backup communication with the -- so the primary and backup communication expectation for -- between the offsite engineer and the on shift crew.

(Simultaneous speaking.)

MS. SCHEETZ: Yes?

MR. SEYMOUR: I was going to say when you're done, if you don't mind, there's a point that I wanted to add here.

MS. SCHEETZ: Okay, go ahead. Yeah, I'm just kind of going through --

(Simultaneous speaking.)

MR. SEYMOUR: Okay.

MEMBER BROWN: This is Charlie Brown again. Thanks, Vicki. It's kind of a dual thing. Cybersecurity is cybersecurity. You've got to deal with that when you're going to be whatever.

The issue with any of the remote getting offsite information is how do you make sure that the systems that provide that are still okay if you've got nobody onsite. If you've got people onsite, then you've got somebody you can talk to, at least by phone if nothing else. But the cybersecurity issues are ones you have to deal with obviously.

But the equipment onsite that you have

should be treated similar to, like, we have -- what's an example? For example, say if a plant has to have a reactor trip system. It may be safe, but it has to have one. And what we do with the local plants is they have no access from anything via the internet or outside of the quote, defensive architecture.

In other words, it's all one way communication from those. And the only place you can control them is from a main control room onsite. Now if you've got offsite stuff where you don't -- that you're trying to control it, now you've made yourself susceptible to the cyber issue. But you also have the issue of how do you know the system is really responding properly.

MS. SCHEETZ: Okay. So --

MEMBER BROWN: And that's very difficult to do without people that are there onsite. So --

MS. SCHEETZ: I just want to clarify that this engineering expertise is, like, technical assistance. They have no control over any plant function offsite. They're going to back up the crew, provide assistance. They are not to direct actions for the crew to take.

They can provide their independent assessment of what's going on and what might need to

happen. It's technical assistance, not any kind of direction and absolutely no ability to control the plant from offsite. That's not the purpose of this.

MEMBER BROWN: But the purpose is they would provide guidance to those who may need assistance in being told what they need to look for.

MS. SCHEETZ: Correct. Just like a traditional shift technical advisor. They just don't have to be in the control room. They have similar data feeds offsite and they can advise the crew and talk. There's an expectation that there's two-way communications back and forth.

(Simultaneous speaking.)

MEMBER BROWN: With people onsite, I'm not -- the training will be what the training will be. Matt and Greg know far more about that than what's needed. But it's not just the reactor plant that needs to have onsite people.

I mean, you've got other plant systems. And without people there, I'm worried about everybody thinking you can have everybody offsite and nobody is there. And you don't smell the plant. You don't hear it.

Hearing is one of the main ways of making sure you know your plant is operating correctly just

like in your house. When you don't hear noises coming from your refrigerator, you know it's not working. So that's one of the biggest issues I have, and I've been in many, many plants as well as Greg and Matt have.

And you're standing back at an engineering space and people touring or they're walking around. And all of a sudden, they don't hear things, say what's going on. And it may not be obvious to operators.

So having nobody in the plant is my biggest concern, that we're giving seed corn for people to go off and do that or operate that way and have nobody onsite. I don't think that's practical from an NRC safety standpoint in my particular opinion. So as long as we got people there and they can understand direction from somebody else, if Greg and Matt are happy with that, I'll be happy with that. I just don't --

MEMBER HALNON: Charlie, I'm keeping an open mind. I always go back to the fact that the staffing plan has to reflect this and it has to be approved by the NRC. So they will have a bite at the apple to see if it's adequate or not for the facility -- specific facility. So I rest on the fact that it will not just be willy-nilly done. There will be some

aspect of review.

MEMBER BROWN: Yeah, I got that. I'm always nervous even if the review tells me there's unexpected things that we don't cover by reviews. I'm very leery about having nobody onsite ever.

MEMBER HALNON: I agree.

MEMBER BROWN: That just doesn't make sense to me.

MEMBER BALLINGER: This is Ron Ballinger. These two slides of 135 and 133 are the equivalent work in a previous presentation. And I didn't say anything then.

But the balance between education prerequisites and training or experience for this kind of position is something which is to my mind very important because I guess Dennis can chime in as well because we've all operated plants, both of us. And we know the difference. And to arbitrarily say that this person's got to have a bachelor's degree in engineering, under most circumstances, that's a good thing.

But when it comes to knowing the plant and experience, I'm not sure that requiring a bachelor's degree wouldn't disqualify arbitrarily somebody who is actually more qualified for that position based on

experience and knowing the plant than somebody that just has a bachelor's degree. Maybe I'm not putting it in the right words. And maybe Dennis can say something about that as well.

But that's where I was coming from. So I'm curious as to whether the ISG can reword the requirements with respect to the bachelor's degree to put an or in there or something that allows for the case where you've got a person who has got 25 years' experience, knows the plant backwards and forwards, and even knows what it sounds like as Charlie says. And I definitely agree with him on that. Anyway, what do you say, Dennis?

MR. BLEY: Yeah, I've been sitting here thinking about all of this. Certainly I agree with you and Charlie on that idea of the sounds in a plant in the plants we know. Now some of these new, very small facilities might not have any of the things that make the noises that helped us a lot in the past.

MEMBER BALLINGER: How do you spell Davis-Besse?

MR. BLEY: When we first came up after TMI, when we first came up with having the STA, they grabbed anybody with a degree and threw them in the plants. And it took a good five years or more before

anybody in the plant gave them any credence because they didn't know what they were about when they got in there. So just sticking somebody with a degree isn't enough.

And over time, they became very valuable. But at first, it was more -- well, it was a way to get that kind of expertise in the plant. But it took a while to develop it to be useful.

So I kind of agree with you, Ron. I'm still thinking about what I mentioned a little while ago is I hadn't really thought about the role of the operator in one of these facilities compared to a normal clean power plant. And it strikes me as quite different because if we get what people are talking about here, the automation is going to run just about everything, including response to upsets.

So an operator who understands all the procedures, well, there might not be any procedures because you don't need people to do anything. It strikes me the role of the operator in one of these things if they're really run almost entirely by automation. I'm sorry. I got something wrong with my computer.

MS. SCHEETZ: Okay. So this is Maurin. I'm just going to go back to the original purpose of

the degree requirement. I hear what you're saying. And yes, there could be somebody who's a really good candidate for this role who doesn't have a technical degree.

But we're going after the need for understanding engineering fundamentals, something that the Commission policy says is exactly what having an engineering degree is going to provide you. And so when the crew is dealing with situations that they don't understand, that's where you're going to rely on that engineering degree, those fundamentals that you learn through an academic program. So that's the purpose of this. I do agree that there could be somebody else that would be really good at that. So --

MEMBER BALLINGER: Is what you're saying true? In other words, the fact that I know F equals MA, when the plant is coming down around somebody's ears, again, is what you're saying true?

MR. BLEY: This is Dennis. I turned off the noise that was going on. I kind of think the role of the operator in some of these facilities might end up being more analogous to the role of the STA who then has the ability do some operation or shutting down than to the SRO, RO model because they're mostly

going to be monitoring and have to understand if things aren't going the way the automation expects it to go and know how to intervene.

So it's something a little different. And that kind of expertise helps. What we saw after TMI-2 was that operators at the time, a great many of them, had come into the program and didn't understand the thermal hydraulics of the plants. Now that's been remedied since then. But it was a surprising number to me. And having that kind of knowledge is important if it's a thermal plan.

MS. SCHEETZ: Okay. Again, this is also a mix. So we're looking for that mix of experience and education background. So this helps on the education side of that mix. Jesse, did you want to say something? You had your hand up, but there's some other hands.

MR. SEYMOUR: Yeah, I appreciate that, Maurin. It's just a couple points I want to make just to clarify. So a very, very fundamental difference here that this team took in putting together this language and this is something we approach very deliberately.

And we went through a couple of iterations getting to where we're at is that in contrast with

Part 55, we elected to codify the shift technical advisor equivalent, right, this engineering expertise requirements within our language. And it's something that gets overlooked a lot within Part 55 is that the only place where the requirement associated with the STA really appears is in the training rule requirements, right? 51.20, right?

So if you go through the staffing portion of 50.54, you don't see a place where it's saying, and you need to have one STA on your crew, right? So it is something that exists as a training program requirement. And it's something lives in Commission policy.

So the way that it was implemented for the legacy plans that are out there is they were issued orders in the aftermath of TMI. That's enough to get this STA rule. So that's the way that we go there now.

So we have to consider how we want to approach this here. And so by design, we elected to codify the staffing requirement. And one of the reasons why we codified it, one, and the most important reason was for clarity, right?

If we're expecting this rule, then put it in the rule, right? So make it very clear so we got

clarity, regulatory certainty. But the other reason is this because what it does is it leaves the door open for the submittal of exemption requests, right?

So again, getting back to the point about, well, experience, operations, different considerations, right, this myriad of things that could come up. What if there was a really compelling case where someone could take a different approach to fulfilling this requirement than what we have embedded in the rule here. Because it is codified or would be, right?

It advances preliminary rule language. The option would be there to submit an exemption request, right? Now that exemption request would have to meet all the requirements associated with exemptions, right, authorized by law, so on and so forth, right? They would have to clear all those hurdles.

Now we see this requirement that we're proposing here as being something that is reasonable, that is flexible, and that we expect to be met. However, just by design, the potential does exist that someone could exempt -- could request an exemption if they really could make a case like that. But getting back to Maurin's point, why a degree requirement,

again, the Commission has laid out in policy statements this desire to have education being part of that mix.

And yet what we do with the engineering expertise requirement is we don't completely base the qualification to fulfill that role in solely the education. We also require familiarity with plant operations. And so that is something that Maurin has worked into the guidance as well too is those types of topical areas that we would expect to see.

The closest analogy that I can give to the Committee is that I was a non-licensed shift technical advisor at one point in my career, then I was licensed later on. And when I was a non-licensed shift technical advisor, I went through an abbreviated course. Again, it wasn't the 18-month licensed operator in training.

It was more, like, an instructor certification that ran for about eight months. And we went through all the fundamental stuff, the systems, right, the generic fundamentals, the emergency operating procedures, functional restoration procedures and so on and so forth, right? Mitigating core damage?

We went through that whole suite of

things. So again, there's ways outside of a license to achieve that familiarity of plant operations from a training standpoint, right? That's separate and distinct from the college education. And that is something that I think that we adhere to the spirit fairly well within the guidance. So Maurin, that's all I wanted to point out.

MEMBER HALNON: Jesse, this is Greg. That STA training program is somewhat driven by INPO. And we're not assuming that these plants are accredited under INPO or the academy. So I think the point is, is that they maybe need to see some kind of language relative to the level of operator training or plant training that's required in addition to the degree.

MR. SEYMOUR: So it's a good point, right? And I am familiar with the same INPO, you know, and academy documents and programmatic features that are there. And everything essentially that we do here, we have to always allow for the possibility that plants could pursue accreditation or they might not.

So we have to leave the mechanisms in place to approach all these things on our own. But something I want to do is, Maurin, if you could, we actually went ahead and articulated those topics within our guidance, right? So again, this isn't

derived from anything that would be proprietary or anything like that.

This is based on our own analysis and assessment and so forth. And again, Maurin, I don't know, if you have that, could you just go through that real quick? Maybe that will help to alleviate this.

MS. SCHEETZ: Right, I mentioned some of them when I went through this slide. But it's in the guidance. There's a list of topics for that initial training program for the engineer.

And it's stuff that's very similar to current STA training courses, mitigating core damage, operating procedures, integrated procedures, generic fundamentals. There's a whole thing of them. It's in the ISG itself. You can see them.

MR. WIDMAYER: Hey, Dave. It looks like Steve Schultz has a question.

CHAIR PETTI: Yeah, Steve. Go ahead.

MR. SCHULTZ: I have a couple comments, and the second might turn into a question. The first comment is that really appreciate the job that has been done in providing the augmentation of NUREG-1791 in this regard. A very complete job has been done to put that in place in the interim guidance.

And I think it will be quite -- it will be

relatively straightforward to move it into additional guidance in the future as a modified NUREG. The one piece that needs to be addressed that would be very, very helpful in moving forward next would be to include the revised Appendix A for 1791. The review checklist is not prepared yet. But that would be a next step that would be very helpful in the review guidance.

Second comment relates to this discussion on engineering expertise. And where I start with this is that the fleets of plants that are in process of being developed have been designed -- they've been engineered to reduce the need for operator action. And yet it seems there that we kind of have an imbalance here between the training and the focus on operators and the training and qualification for the engineering expertise. It seems as if the engineering expertise needs to be there for sure.

But the role that is being proposed is relatively minimal. And the training and qualification discussions and focus again is almost missing. It seems like engineering expertise that's well trained with regard to the function, operation of the facility, all of that needs to be really a major focus. As Charlie indicated, the thing that was

mostly likely needed in this area for engineering expertise will be for the individual to know exactly how the facility is designed, exactly how it's been operated and only having educational prerequisites and not having detailed training and qualification associated with a facility is going to be something that's really going to be missing.

All the other elements I think are certainly needed. But I get a little concerned when we're talking about some of these new designs. And when we're focused on operator training, operator training, operator training and don't focus on the need for engineering expertise that's very well trained to respond to things that operators will not have knowledge of unless it -- because they're dealing with something that has failed which has been engineered into the plant, designed into the plant, and needs to be addressed.

MS. SCHEETZ: So this is Maurin. Just to reply to that, I think the vision behind this is that they are trained in the operations of the plant. And it's actually written in the rule language that they're familiar with the operation of the plant.

So it's not just relying only on their engineering degree. There is training and

qualification expectations that are listed in the interim staff guidance document. And it looks very similar to operator trainers also, simulation facility. They should be doing this training in a simulation facility.

So I would say there's a lot of equivalence between how the operators would also be trained. And an applicant may just put them all together and train them at the same time. That's certainly one way to meet some of these training and qualification criteria in our staffing guidance here.

So we're just trying to be very flexible with how this is met and look at a bunch of different ways that an applicant may come up with meeting this. We're trying to be very inclusive. That's all. It's not laid out specifically in the rule language. It's over in guidance.

MR. SCHULTZ: I understand that, and I appreciate it. But it does seem as things are presented that the engineering expertise is an, oh, by the way, we need to do that because it's been suggested or it's been required. And I think it's extremely important in the new designs that we're describing and discussing.

CHAIR PETTI: So let me just give you sort

of my perspective on some of this. When one looks at some of these advanced reactors, there really is no procedures that some of them can rely on because they've never been built, right? So some of these designs are going to have to have loops I can imagine with molten salt, even with sodium because it's been so long since a sodium reactor has operated in this country and that they may actually do some hands-on training, both at the engineering level and the operator level on those loops so that they can get a sense of what it's like.

Because it's not like a water loop necessarily. And so I just think that we just have to make sure we've got the flexibility in there that it's going to look a little different because some of these don't even what to go through prototypes. A lot of stuff you learn if you actually had a prototype.

But some of them doing want to go through that step. And so at the very beginning, things could look a little bit different than a lot of the thought process that goes into this stuff where we've got experience out there on systems and similar systems. Some of these are not going to look like anything else that we've seen in the past.

Even in rad protection, in some of these,

you're going to be dealing with tritium. It's a very different thing than dealing with some of the rad issues and light water reactor plants, for example. I see Jesse has his hand up. Go ahead.

MR. SEYMOUR: Oh, yes. Thank you. I just wanted to add to Maurin's point about the training and qualification that we get to at the level of guidance for the engineering expertise individuals because there is that kind of detail about topical coverage and so forth at the level of guidance. I also want to point out that at the level of the rule under 53.830, Part 53 contains its own corollary to the 51.20 training rule.

So essentially Part 53 has its own version of the training rule embedded in there. And by and large, it's very similar to the 51.20 training rule with a few targeted differences. Namely, it allows more flexibility and time frames.

It also approaches the categories of personnel from a higher level and just to account for differences in roles and so forth. And the reason why I saw this is this. Included as an example of one of the types of personnel that would be within the scope of that is individuals who fulfill this engineering expertise role.

And what that means is that the expectation for those individuals under 53.830 would be that they would be part of a systematic approach of base training program. So again, when we talk about their ability to fulfill their roles and responsibilities and so forth -- again, we're not talking about guidance now. We're talking about rule language, right?

They would be required to be covered by a training program that is approached from a systematic approach training standpoint. And what that would entail is, again, all those things we talked about before, a detailed review of the tasks associated with their job, training, learning objectives, assessing their mastery of those skills, right, remediating deficiencies, right, again, going through that process. And that is something that's not just a one-time thing, right? That's an ongoing process.

So again, we swept up the engineering expertise individuals in the pool of individuals that we see as being covered under that training rule. So I just want to say that even though at the level of the rule and even in the preamble, we don't necessarily get into the specific topical coverage. We do cover that type of detail within the guidance

that we would use to review that staffing plan. And also, there will be a regulatory hook to ensure that there is an acceptable training program that's being implemented for these individuals.

CHAIR PETTI: Any more questions, members?

MEMBER BROWN: Yeah, just one observation. We're talking -- this is Charlie again. We talk about plant, plant, plant. And the focus seems to be pretty much on the reactor plant, the advanced reactors, et cetera, et cetera.

But all of these new plants also are supposed to be generating electricity for somebody. And the other half of the plant is a critical aspect of that which is totally different from its modes of operation relative to the reactor plant. And that interaction with that new reactor plant is going to be different.

If you look at how do they transfer heat and how do they get the steam to run the TG subs. Or how do they generate the heat such that they become a hot plate for some thermoelectric converters or whatever? But there's got to be something to convert it.

And that interaction between those systems and the reactor plan are also critical for this type

of thing. And again, that's operations oriented people familiar with what those things do. If you generate a steam plant, there's a lot of systems that go along with it to generate electricity. That's their purpose, not just to produce neutrons. So we seem to lose that in the discussion or it seems we lose that in the discussion. That's the only thing I'd like to remind us to think about as we're doing this.

MS. SCHEETZ: So thank you, Member Brown. I agree with you that that's important and shouldn't be lost for this role of the engineering expertise. So that's where the systematic approach to training which is going to be required by regulation which Jesse just talked about would catch that type of integrated plant operation.

What does the engineer need to know about the other side of the steam plant and what's being generated. So that's where the systematic approach to training, the expectation if you have an adequate SAT process, it's going to track those types of tasks and understanding knowledge and abilities for the engineer's position. So that's kind of how this fleshes out and gets implemented. That's all.

MEMBER BROWN: There's a lot of heat

removal when a steam plant trips, you know it. And you know how the water reacts. But the new advanced plants based on -- I forget, sodium or this or whatever, FLiBe or whatever they're supposed to be.

Heat removal goes away. How do they respond to an instantaneous heat removal -- lack of heat removal? I mean, there's got to be some way of us really understanding what that interaction is.

We really haven't addressed that all that much in our discussions. So thanks for your input. That's what I'm interested in getting the point across. So thanks.

CHAIR PETTI: Other comments? If not, let's just go on to the next presentation.

MS. SCHEETZ: Okay. So that's the end of my presentation. I'm going to turn it over to Dr. Dave Desaulniers. He's going to talk about our last ISG that we have for the subcommittee today.

MR. DESAULNIERS: Okay. Hello, everyone. We're right at noon, so I'm a little conflicted if I should be saying -- I guess good afternoon here at 12:05. I'm just putting my camera on for a moment here. It's been a while since I've had an opportunity to address some of the members.

My name is David Desaulniers. I'm the

senior technical advisor for human factors and human performance evaluation. I'm in the Office of Nuclear Reactor Regulation.

And now I'll be providing an overview of the third of the ISGs that we're talking about today. And this one is on the development of scalable human factors engineering review plans. So just in a nutshell when we're talking about scalable human factors engineering review plans, we're really talking just simply about how the staff will tailor their review plan to the specific application that's before them for review.

And my presentation, I'll address this in three parts essentially. I'm going to start out by providing some background in terms of how we do these reviews today and what our regulatory basis is for that. The second part of my presentation, we'll just focus generally on what is this process of scaling the reviews.

And the in the third part of my presentation, I'll go more into the details of the actual guidance document that we've developed. Wouldn't you know I get a call coming in now. I'm like the Maytag repairman here, and I never get a call until we're in the middle of a meeting. Pardon for

that interruption. So we can go on to the next slide, please.

So speaking to current practice, the bullet at the top of your slide here is the Part 50 requirement pertaining to human factors engineering. And it, in essence, requires that an applicant submit for Commission review a control room design that reflects state of the art human factors engineering. When the staff gets applications for large light water reactors under Part 50 or Part 52, our current guidance is to turn to NUREG-0800, Chapter 18 which covers human factors engineering.

And that guidance points more specifically to guidance principally in NUREG-0711, although there are other more detailed guidance documents that references. 0711 really provides the overall structure to our reviews. And that review guidance is really based in systems engineering.

And the implication there is as we conduct our reviews, what we're doing is we're looking at the review from the design from its early conception through the development of functional requirements analysis and function allocation and to task analysis and the development of a design, whether it's the HSIs, the procedures, the training. And then through

verification and validation of that design into the design implementation and human performance monitoring. Again, my apologies. Someone is desperately trying to reach me.

The point I want to bring out from this is that in doing this review which covers 12 different program elements and involves consideration of more than 300 review criteria, as you can imagine, this is a rather resource intensive process. Through more recent review activities, particularly those that were done under Part 53, what we've seen is gained insights that we believe we can be a little bit more targeted, in the way we do our reviews to be more efficient. And also we need to start thinking about the changing role of the operator in the plants that our assumption in the past that the most important actions were those that were going to be performed by operators.

And those actions were to be performed by individuals in a main control room. What we're starting to see particularly with advanced reactor technologies that are a conception of the role of human performance, where it contributes, and where it's being performed is beginning to change. And I'll note, for instance, in that regard, intended increased use of inherent safety characteristics and passive

safety systems, the role of the operator may be substantially reduced.

Yet those systems need to be maintained. They need to be capable of performing their functions when called upon. So activities such as surveillances, non-destructive examinations, various maintenance activities, verification of lineups could in a relative sense start becoming the more important human contribution to the safety of some of these new plants.

And our review practices need to start thinking in those terms. So if you we move on to the next slide, please. So looking ahead to what we're proposing in Part 53, rather than a focus on the main control room for human factors engineering, the requirement and I'll speak to it generally here and more specifically later in the presentation is that HFE would be required where necessary to support important human actions.

And aligning with that, our review process would be that we would scale our reviews considering the characteristics of the facility design and its operation. Next slide, please. So I mentioned the Part 53 requirement for HFE. The second bullet that you're looking at on this slide should've been in

italics to emphasize really this is an exception from the rule in terms of what is being proposed as the human factors engineering requirement.

And you can see it that it parallels what's currently in Part 50 rather closely but has some important differences. It must reflect state of the art human factors principles for safe and reliable performance in all locations that human activities are expected for performing or supporting the continued availability of plant safety or emergency response functions. So it's a non-prescriptive requirement.

It provides the ability for the applicant to design their facilities such that there's not an assumption of control functions being performed in any particular location. But wherever those activities are performed, that's where HFE needs to be focused. Next slide, please. So the objective of the guide that we've developed, the interim staff guidance, is to guide the reviewer through the process of developing an application-specific review plan and identifying appropriate HFE review guidance to conduct that plan.

So I just want to emphasize that point that unlike the ISGs that you were hearing about earlier this morning where we were talking about

guidance or actually conducting the reviews. Here we're talking about really a process for developing the review plan. It doesn't get into specifically conducting the review.

So in essence, it will be used in place of NUREG-0800, Chapter 18. And like the other guidance documents that you heard about this morning, this is being developed as an interim staff guidance document. We're taking on although this is -- you will see an evolution from our use of NUREG-0711. I won't say it's completely revolutionary.

It is a new process. We expect we'll be learning the process of implementing the ISG. And so that at some point once we gain that experience in its use, we would be looking to integrate those lessons learned and transfer this ISG guidance into a NUREG. Next slide, please.

So this just gives you a quick high level snapshot of the overall process in terms of timing. We proposed to begin scaling the review plan during pre-application engagements. And it's noted if conducted, pre-application engagements are not required. But of course, the agency highly encourages applicants to engage with the agency prior to submittal of their application.

And our experience is that we're seeing applicants doing that and that it's been very helpful for both the applicant and the staff to understand the application, the timing of the submittals what may be missing that the staff may need to be part of that application. So we would be -- beginning our development during that pre-application period and concluding it with the completion of the application acceptance review. And that timing also is useful in that this process as I hope you'll see will provide the staff a good mechanism to really looking at an application to assess it for its acceptability to ensure that it's complete in providing the information that will support the staff's review according to the agreed upon timeline.

And in general, this process is conducted in five steps that lead in the end to the staff assembling a review plan that's specific to that particular application. And in my next slides, I'll go into that process now a little bit more in detail. So next slide, please. So what you have here on your screen is the five steps to the scaling process.

The first step -- and I'll note I'm going to go through these. I'm going to return to each of these steps later in my presentation when we talk

about the supporting guidance. So this is basically just an introduction to the process.

The characterization phase is noted here, a way of establishing a documented understanding of the design and its operation from a human factors engineering perspective. And this is going to be important because as we've been hearing in the discussions throughout the morning, these facilities are going to be potentially much different than what we've looked at in large light water reactors. The assumptions that we've made in the past or could reasonably make can largely be set aside.

We need to as a human factors reviewer understand the overall operation of this facility so obviously the HFE reviewer is not responsible for reviewing all aspects. But they need an integrated understanding of the operation of that facility. What is its mission?

It may be electricity production. It may be some other mission. Maybe it's hydrogen production. Need to understand the general size of this facility. Are we talking something closer to the scale of a large light water reactor? Or are we talking about something that's a micro reactor? Is it a multi-module facility.

These broad observations need to be considered to provide the context for the human factors reviewer to be able to conduct the subsequent stages. And I'll come back to it again, as I said, to some of these things if there's more question that what's involved in these steps. Targeting now is where the second stage where the HFE reviewer is beginning to focus on those specific human system interfaces or operations, specific actions that are required of individuals in the facility to identify what this review is going to begin to focus on.

This is the beginning of really the scoping of the review. And the third phase, screening, it's also a process -- oops, please go back to the slide that you were on. Thank you. And screening, now rather than focusing on the human system interfaces or the actions of the individuals, we're looking at the human factors engineering program that the applicant has used what particular activities have they conducted in order to be able to develop a design that supports the human performance role and the safe operation of that facility.

We need to understand what activities they have conducted, what activities have they yet to conduct but are maybe ongoing during the process of

our review and how they really relate to each of the targets that we're potentially look at. In the fourth stage, grading, we're now starting to look at what are the specific standards and guidance documents that we would apply to the review. You will note or perhaps recall that when I was talking about 0711 and the 300 criteria that were built in to that guidance document, what we're doing now in this process is basically separating out the specific review criteria from the process.

So we'll be looking in the grading process potentially to the criterion 0711, perhaps the guidance in 0700, perhaps the other standards out there. But we will be selecting those based on the particular facility that's before us for review in terms of what would be the most appropriate guidance available at that time. And then in the fifth part of this process, we're putting this review plan together in an integrated fashion considering the preceding four steps such that we bring together a plan that's sufficient to support a reasonable assurance determination but looks at the overall process to ensure that we're gaining efficiencies where we can and that we're doing this in a risk informed manner where we're taking advantage of the available safety

and risk insights that are provided through the application. Next slide, please.

So 20,000 foot level moving on to considering the specific guidance document, it is really set up in two major pieces. The main body of the guidance provides the essential guidance for the reviewer to develop the review plan. And then there are a series of appendices to that document that provides supporting guidance.

And those appendices are structured such that they relate to each of the five steps of the process that I just described on the proceeding slide. Next slid, please. This slide provides an overview of the main structure of the main body of the guidance document. Some of the key features that you would see as you flip through that guidance document is of course its applicability.

What types of applications does this guidance apply to? And in this case, we're talking about standard design approvals, design certifications, combined licenses, and operating licenses. It also goes into the rationale for scaling the reviews which I spoke to in brief earlier in this presentation talking about a need to have a process that really is capable of addressing a diversity of

designs in a focused and efficient manner.

The guidance also lists the regulatory basis for conducting the review. And while I noted in this presentation in the particular requirement that underpins the HFE requirement, Part 53 has a number of other requirements that are also supporting the HFE review. Some of these, we've already touched upon a requirement to submit a staffing analysis, a requirement to submit a concept of operations document, a requirement to submit a functional requirements analysis, and so forth as well as Jesse also noted there are various requirements that were analogous to those that you would find in Part 50 as the post-TMI instrumentation requirements.

So those are all provided to the review as part of the regulatory basis for doing the review. And then the body of the guidance follows a standard format, taking the reviewer through each step where the objective of the step is presented. The process for implementing that step is provided and concluding with the reviewer responsibilities for completing that particular step of the process.

Overall, what this guidance is doing is essentially focusing on what to do or how to accomplish scaling a review which is a little bit of

a distinction I'll make from the focus in the appendices which I believe we'll be turning to on the next slide. So now we're getting into the appendices. And this is supporting guidance.

So rather than focusing on what to do, this is getting more into methods as to how to implement each of these steps of the scaling process. They're recommended methods. They're not -- the reviewer is not bound to using the particular guidance in the appendices.

But it provides a starting point for a way to think about implementing each of these steps of the process. Also, in general, these appendices will provide pointers to other sources of additional guidance. What you'll find here is we drew upon the body of research and guidance that's been developed by our Office of Research over the years relating to modular reactors and advanced reactor designs to point the reviewer to more detailed guidance documents that may support the review. Next slide, please.

So coming back to the characterization, what you're getting into now here in more detail for the Appendix A of this ISG is an overview of the characterization process that walks the reviewer into considerations of what really needs to be in the

characterization. What are the essential elements? And some of those are the concept of operations for the facility, the safety analysis methods and their results that we would be providing the risk and safety insights to help guide the review, the identification of important human actions, the design process, specifically, the human factors engineering design processes that the applicant used, their scope and the timing of those activities.

And also things like the compliance with requirements. Is this application looking to take any exemptions from relevant requirements? So all these are the types of things that the reviewer would be pointed to, to ensure to include in the characterization.

The guidance also addresses how to organize this characterization. And in essence what we encourage a reviewer to do is to use the concept of operations to organize this characterization. It also finally touches upon noting that this characterization can be an aid in coordinating reviews.

You heard earlier this morning about staffing and operator licensing. These reviews are all going to interplay because as you've heard, there's a fair bit of flexibility and what the

applicants can be proposing. And so again, we can't be making assumptions that, oh, we're going to have an traditional control room and it will have this man ROs and this many SROs and this is what the training program will look like.

These are variables that we need to consider and have as context for the HFE review. And the characterization can be used as a tool to ensure that we help coordinate our reviews and inform each other as new insights are developing during the course of the review. I think we'll go to the next slide, please.

Targeting guidance, so that's in Appendix B. And here we speak to the general principles for target selection. And the guidance that we provide there is fairly fundamental in thinking about targets. Specifically the three criteria that we recommend for target selection are safety significance, risk importance, and uncertainty.

And I'll just take a moment to comment on that last one for a moment because as was commented earlier in the discussions today, these new designs we are looking at less operating experience for many of these designs we anticipate than what we have for large lights. So that introduces a certain amount of

uncertainty. So there may be uncertainty associated with the technology, uncertainty associated with perhaps a new type of HSI or a new type of concept of operations in terms of how perhaps a crew would operate or be configured in terms of its staffing.

There's also uncertainty potentially introduced by the level of design development that we have at the time the application comes on our desk and how that might be evolving during the process. So these are considerations that are touched upon in the targeting guidance. Going along with that, we provide rather a list of 38 prospective characteristics of advanced reactor designs and operations that should be considerations for targeting if they present themselves in the application.

And again, these are just examples. This list is not meant to be all inclusive. It just pulls upon the existing body of research that we have available to the staff in terms of issues that we've seen that could be potentially important to safe operation for some of these new facilities.

So these summaries in the targeting guidance touch upon the human performance implications of some of these aspects of the designs or operations and also provides a characterization of the available

guidance for use in conducting the reviews. Next slide, please. Appendix C is for the screening process. And again, this is the process of determining which particular human factors engineering activities that we would be looking at.

And again, we're talking about things like operating experience review, task analysis, integrated system validation, and so forth, the general program elements of 0711. Or if they're using a different model, the analogous types of processes that the applicant would be using. Determining which strategies -- excuse me. Determining which of these activities would screen in or screen out of the review process to provide some guidance with respect to conducting that process.

Here the staff is essentially using fundamentally a be risk smart type of approach, thinking, all right, what are the potential -- what could go wrong if we leave out one of these activities out of the scope of our review? What are the consequences of that and how likely is that to be? Some of that thinking has to take into consideration there's a balance in looking at some of the developmental activities relative to some of the verification and validation activities.

If we don't look at something during the development phase, do we have good opportunity to get understanding of the effectiveness of the applicant and that design activity when we go through the verification and validation? The screening guidance also addresses particular implications and challenges of advanced reactor design reviews and their characteristics. As noted, we're looking more now rather than active safety systems.

We're looking at passive systems or potentially inherently safe -- excuse me -- inherently safe designs. What are those implications for identifying important human actions? What are the implications of using probabilistic risk assessment let's say as opposed to integrated safety analyses? So the guidance touches upon some of those considerations as well. Next slide, please.

So Appendix D addresses grading. And again, grading is this process of selecting the particular standards and guidance documents that'll be used during the course of the review. Now typically an applicant is going to be identifying the standards that were used in the development of their design.

And the reviewer's responsibility there would be to verify that choice of document was

appropriate. But there may be cases where either the -- well, I'll take the case where the applicant has cited a guidance document that lacks prior NRC endorsement. That's not prohibited clearly, but it's something that we need to consider.

So there's guidance to consider if we're going to be conducting a review using a standard perhaps that has not had prior NRC endorsement. And we have to anticipate this with advanced technologies. As we know, it's been difficult for the standards community to keep pace with the development in the development of the reactor technologies.

So we'll be seeing cases where standards may have been just recently released but not have come before the NRC for endorsement. To provide a resource for the reviewer in these cases, Appendix D does provide a table that provides references to many different HFE guidance documents. There we've included documents that were developed specifically for the nuclear industry as well as those that were developed in non-nuclear domains but may touch upon technologies that we see likely to be used in the nuclear industry. Next slide, please.

So the final appendix is for assembling the review plan. In here what the guidance focuses on

is how to guide the -- the reviewer should take a look at the results of the prior steps to develop an integrated review plan focusing on ensuring that there is adequate coverage to in the end be able to support a reasonable assurance determination. And this guidance also addresses just the format for developing the review plan.

So there's, in fact, a template that the reviewer can consider in terms of presenting the plan, ensuring that it addresses the resources that are needed, the timing of the activities and so forth. I think that's my last slide. So with that, I'll conclude my presentation.

CHAIR PETTI: Thank you. Members, questions, comments?

MEMBER SUNSERI: Hey, Dave. This is Matt. I'd just like to say I think the staff has done a pretty reasonable job on a couple of things here. I've spent a fair amount of time leading up to this meeting looking at the proposed ISGs, the revised rule language back and I looked through our letters.

And generally, I find that at least once again in this member's perspective that the staff has been pretty responsive to our previous feedback. They've addressed things such as engineering

experience, where the operator licensing requirements should be whether in the rule or in guidance, and such. And while -- like many things, when we look at them again and again, we can always find maybe some additional points to make and there's probably a couple that we can make now. I'd just like to say I think by and large what I've been seeing at least through these ISGs has been an improvement before this. So that's my view.

CHAIR PETTI: Thanks.

MR. DESAULNIERS: Thank you. I appreciate hearing that.

CHAIR PETTI: Other comments from other members? Okay. Well, we get an extra 20 minutes before lunch then as I read the agenda.

MR. SCHULTZ: Dave?

CHAIR PETTI: Yeah.

MR. SCHULTZ: Just a comment for David. The work that you've done here and the staff has done here, it really provides a very thorough and comprehensive approach to developing the review plan. When I went through the document as well as the appendices, it struck me -- I'm not an expert in the area.

But it struck me that there was a lot of

information -- and maybe this is necessary -- a lot of information associated with the plan development that included also as you've noted here guidance that is related to performing the review itself. And so it was difficult although you got very detailed description of the steps that need to be done to establish the review plan, it seemed like the tasks associated with addressing those steps were mixing the review requirements with the way in which the review would be performed itself. In other words, there was a lot of information in the ISG that focused on both setting it up the review and the planning stage and then also what the review would entail.

And I saw that the appendices just somewhat augmented that. I think in the application of the plan, I think it's a good document. But I feel that in the application of this ISG, you're likely to find that you'll be able to simplify the planning stage piece of the document. And you probably have sufficient information within the document itself to actually provide -- it already provides the documentation and the guidance to perform the review itself.

MR. DESAULNIERS: Okay. Thank you for that observation. I think that that's probably -- I'd

have to agree -- a fair assessment in that it may be somewhat of an artifact of the nature of the guidance documents that we drew upon in order to be able to pull together this particular ISG, tend to be more focused down into the level of conducting the actual review because that's normally where we spend most of our time. I think that in looking at some of that material, we did struggle in terms of thinking about, well, how much detail that we should leave in here or relegate to other documents.

And our inclination at this time was to keep it intact such that although, yes, some of that guidance in the appendices gets more into actually conducting the review, understanding that what it's going to be entailed does feed into developing a review plan in terms of understanding the resources that would need to be involved to conduct that activity, what level of guidance is available to support it. And so I think these, while they're necessary for conducting the review, they do inform how we develop the review plan. But it is a balance. It's something that we'll certainly keep an eye towards how we can improve this guidance as we go forward.

MR. SCHULTZ: Thanks for the response,

David. Yeah, I saw the same challenge that you had. I reviewed the NUREGs that supported these activities in the past and needed to be incorporated in this documentation as well. And I think you did an excellent job pulling out that information which pertains to the new commercial reactors review. But again, it seemed like there was a lot of information there that as it's presented would perhaps someone might believe it all had to be incorporated into the planning stage when, in fact, it really could be relegated to the review stage. Thank you.

MR. DESAULNIERS: Thank you.

MR. GREEN: If I can just add onto this, this is Brian Green, the human factors team lead. Myself and some of the others who worked on the NuScale review had provided a lot of input about that planning stage because the idea of scaling a review has gone back some time. And we had considered it, trying to do it in the past.

And without a guidance document like this, we realized we weren't going to be able to do it in a consistent and reliable manner. So we had kind of backed away. And we'd had a lot of discussions internally about at the beginning of the review if we knew what we knew at the end of the review, it

would've been easy.

But that's not necessarily the case. So we had pushed for a lot of the detail to be added in to help us make those decisions and put those guardrails in so that we don't make bad decisions early on. And I think that a lot of the detail you see in the draft is to help us establish what those guardrails should be.

MR. SCHULTZ: Brian, this is Steve. I did see that in the guidance as it was developed. And I do appreciate -- I felt that's exactly where it was coming from and where it needs to go. Thank you.

MR. GREEN: Great. Thank you.

CHAIR PETTI: Any other comments? Well, then with that, we'll recess and be back at 2:00 Eastern Time. Thank you, everyone.

(Whereupon, the above-entitled matter went off the record at 12:48 p.m. and resumed at 2:02 p.m.)

CHAIR PETTI: Why don't we just start now here after lunch, Bill?

MR. RECKLEY: Okay. Thank you, Dave.

So, what we're going to talk about this afternoon, we're going to go through some of our previous interactions and the letter, and by and large, that will be through the letters, the Interim

Letters that the ACRS provided us; talk about, also, some of the other feedback we have, and then, most likely, just have some additional time, if there's more questions or discussion.

So, Billy, if we want to go to slide 153?

MEMBER BALLINGER: This is Ron.

Before you get started, I'd like to make just a little bit of a statement.

I was saying this evolution has been going on a very long time. And I, for one, have been extremely impressed with the evolution and the response that you folks have made to our suggestions. So, I just want to, before I forget and lose my mind, I wanted to make sure I got that out.

MR. RECKLEY: Thank you.

And the first slide here is probably an indication of that to some degree. You can see your first Interim Letter was two years ago. And we've been working with stakeholders and a lot of discussions with the staff. I don't want to underestimate how much of the iterations have just been due to the discussions and the give-and-take between the staff. You see many of them on these meetings. So, it has evolved over the course of the last two, two and a half years.

So, thank you. And I really think we've gotten a lot of out of the interactions with the public, the interactions with the ACRS, and again, our own interactions with each other.

Just I'll kind of quickly go through these because of them we would have talked about during these last two years, as you've seen the package evolve.

So, in the October letter, October 2020 letter, at that point we were just kicking off, talking about the general Framework, this notion of laying it out in the form of a life cycle. And basically, that's not changed much over that time period.

One of the first comments -- and this is also a comment we got in other interactions related to advanced reactors and some of the other activities in the interactions between the staff and the ACRS -- was this notion of a need for systematic assessments of hazards, initiating events, event scenarios. And so, that's been a repeating topic over the last couple of years.

We've responded to that. I think we have fairly specific requirements in both Framework A to do a systematic assessment that's largely based on the

Probabilistic Risk Assessment within Framework A. Boyce Travis talked to you yesterday about Framework B and the safety analysis and the need to address different categories of events.

And then, yesterday you also heard the discussions of DG-1413, which is applicable to not only Part 53, but also would be useful to other areas of the NRC.

So, that topic has played out over the last couple of years.

The third comment in that first Interim Letter was to support prototype testing. We have included the same provisions of 50.43(e) in both Framework A, in Section 440, and in Framework B, in 4730, and there is a typo there. It says, in Framework A, it's a typo, it says, "53.440." That's actually the requirements in Framework A. The general requirements are in 53.90, which is termed Standards for Review.

But all of those provisions are there, and we even in the preamble tried to stress that the notion of 50.43(e), and the repetition here in several places in Part 53, that the performance of safety systems needs to be demonstrated through combinations of tests and experiments, analysis, and if needed,

prototype testing.

So, that is, basically, unchanged from when that proposal was first put in Part 50, when we started to see safety systems that were different from those that were addressed in the general design criteria or the initial plant designs, the Generation II and Generation III plants.

So, that was the first letter. Billy, if we can go to the next slide?

The next Interim Letter we got was in May of 2021. Again, the first comment was on this overall structure and dividing the Subparts, largely to align with the life cycle of a plant, sort of a systems engineering approach.

The second comment -- and this, you've requested many times; I know we were relatively slow in getting this to you -- was a request to have a good explanation. We tried, to some degree, to do that, as we released the text in the form of the discussion tables, but, really, now is about the first time that we're really putting that together and providing it to you in the form of the whole rulemaking package with both the language and the preamble.

So, Billy, we can go to the next slide.

A couple of other points that were made in

the May letter. In that timeframe, we were still toying with the first iterations where we had a two-tiered structure, and that's the language we used. Basically, for design basis accidents and licensing basis events other than design basis accidents, we refer to them in the tiers. Obviously, now we have dropped that several iterations ago.

We still do differentiate in the safety objectives, two objectives. One, no immediate threat to public health and safety, and then, the second, actions as deemed appropriate considering risks to public health and safety.

And that was a way to still distinguish between the requirements largely for safety-related equipment and things that would be addressed under strict controls, like technical specifications, and those things that we would provide more flexibility, the risk-informed approaches, things that would be addressed more through reliability targets, and so forth.

So, we still maintain in Framework A, and also, as does the current requirements carried over Framework B, a distinction between equipment and the role that it plays. But, all that said, we did drop what almost universally was observed to be confusing

using the two-tiered structure.

The Item C was a request, generally, or an observation that it was useful to have something like the general design criteria or, in fact, the general design criteria in one place. We've talked about this several times. Framework B uses or refers to the general design criteria for light water reactors, and then, the expectation that the principal design criteria would be developed based on the general design criteria or using them as a guide for non-light water reactors.

But, for Framework A, again, we've tried to explain it. It takes a top-down approach. As opposed to starting with those design rules, it's top-down starting with the safety criteria, then safety functions, then the design features, and ultimately, the functional design criteria for those SSCs. And you, as we've talked even yesterday, will often end up in the same place, but you've gotten there through a slightly different path, being you've gone through that logic as opposed to starting with the design rules, such as laid out in the general design criteria.

Item D was an observation that or a request in that May letter related to anticipated

operational occurrences, and to maintain a barrier base. This was, if you remember still going over the Licensing Modernization Project, the idea of using a frequency consequence target-type approach, even down into the AAO range, where they would be based on the Part 20-type limits.

So, that gets picked up in large part in Framework B. Again, the requirements for an applicant to identify acceptance criteria for AAOs under that deterministic construct, that will often be a barrier-based approach similar to what's used now for fuel cladding or reactor coolant pressure boundary.

But, in Framework A, we allow that; we expect it to actually be the case that in the analysis that an applicant would take a barrier approach because it's a simpler analysis to perform. But it's left under 53.450(e) that the applicant can, or under that requirement, the applicant must identify the evaluation criteria for each individual anticipated event sequence or AAO, or the whole category. And again, that could be a barrier-based approach or it could be, since we've already endorsed it, the approach in Reg Guide 1.223, which uses a frequency consequence target in terms of public dose -- again, comparable to Part 20 or Subpart I for those

anticipated sequences.

E was a discussion -- again, back in this timeframe there was only Framework A. And so, I'll ask Boyce or Bill Jessup to chime in if there's any observation or if I mischaracterize something in Framework B.

But the letter, again, in the context of Framework A at that time, mentioned that DBAs, the rule should require that the end state be a safe, stable, and subcritical condition. So, the changes we made there was we added "safe, stable" to the requirement for DBAs. The end state of the DBAs under 53.450(f) has to be safe, stable end state.

And we addressed both subcriticality and long-term cooling by the addition of design requirements in 440(g), 53.440(g), which is a design requirement. So, we think we ended up in a comparable place that you were suggesting. We just used two different sections of the rule to get there.

CHAIR PETTI: Bill?

MR. RECKLEY: Yes, Dave?

CHAIR PETTI: Just a question. I couldn't remember this when it came up.

Somewhere in a subsidiary document, some sort of guidance, you know, cold shutdown and hot

shutdown have unique meanings for the current fleet. Those won't work for the advanced reactors because some of the coolants will freeze, will take forever to cool down an HTGR, given all the graphite.

So, is there a place where some of that stuff gets worked out and recognized by the staff in guidance when they do a review?

MR. RECKLEY: It will be, yes, I think there will be an opportunity for technology-specific guidance. Some of that might even come in the context of, let's say, codes and standards. Like the ANS Design Standards --

CHAIR PETTI: Oh, okay.

MR. RECKLEY: -- could include something like that. And then, we could endorse it.

But it's acknowledged, you're exactly right, it will be somewhat different than light water reactors because of the coolants, because of the other constraints. What is the safe, stable end state will vary.

CHAIR PETTI: Right. Yes. Okay. Thanks.

MR. RECKLEY: Okay. And again, Boyce talked yesterday about how the safety analysis works in Framework B. It's very similar to the current construct.

So, Billy, if we want to go to the next slide?

Other issues that were brought out in that May 2021 letter was to clarify the DBAs. We think we've done that to some degree, and it's addressed in guidance. For Framework A, it's in the guidance in Reg Guide 1.223, NEI 18-04.

In terms of the single failure, we tried to address that in the preamble discussion in referring to some of the previous Commission decisions, such as SECY-03-0047, where some of this -- really, another thing, Ron was talking about the evolution. For those of us that have been around a long time, some of this was started, and is a continuing of the evolution of the work that was done back in the Advanced Notice of Proposed Rulemaking and papers such as SECY-03-0047, back in that timeframe.

So, some of these issues were resolved back then, and we brought that up in the preamble for things like Framework A, not including the use of the single failure criteria, but including an increased focus on making sure that the performance of the SSCs are established and maintained.

So, again, in Subpart F, you look at the non-safety-related, but safety-significant SSCs.

There's requirements in the rule for the reliability of those systems to be maintained. The reason for that is, basically, to support the logic that was laid out in SECY-03-0047 to replace or to use as an alternative the reliability approach as opposed to the single failure approach.

So, then, Item 5, from the May 2021 letter was, basically, a repeat, as a matter of emphasis to do this systematic approach. So, we talked about that from the October 2020 letter. We have, we think, specific requirements to do systematic approaches to identify the event sequences. And in addition to that, the guidance issued in the Draft Guidance at this point in DG-1413 that was talked about yesterday.

So, Billy, I think we can go to the next letter.

And the February 17th, 2022 letter was dedicated to operator staffing. And so, I wasn't really going to talk about that letter. We responded to it. And obviously, we've had a couple of meetings with Subcommittee and full Committee even in regards to this topic, including all morning. So, I really hadn't planned to go through what we did with these. Much of it is a little bit -- again, unless there's a desire to go through them, Billy, I think we can just

go to the next slide.

Which brings us to your most recent letter, the August 2nd, 2022 letter, for which we sent a response a couple of weeks ago. And to go through the items in that letter, I'm going to turn it over to Bill Jessup.

MR. JESSUP: Okay. Thanks. Thanks, Bill.

This is Bill Jessup from the NRC staff again.

And I'm going to cover the staff's responses to the eight recommendations and observations that were in the fourth Interim Letter from the ACRS on Part 53. As Bill mentioned, that's the most recent of the ACRS Interim Letters on this topic.

Kind of like Bill did on the previous letter, the third Interim Letter, I'd offer -- and you can see on this slide, in particular, is one example -- a lot of the recommendations the staff has talked about on how we've considered the feedback in the current draft of the rule package, including today and yesterday. So, I don't plan on going into that much detail on some of the recommendations and observations, but we did want to at least acknowledge all eight here and make sure we open up the floor for

some dialog, feedback, and more questions.

So, the slide on the screen right now, this was the first observation, and it focused on the role of the QHOs. I think we had a really robust discussion again on this topic yesterday. And I think as Bill acknowledged yesterday, it's a bit more prominent in Framework A, but certainly relevant to the entire part.

So, we did discuss it at length yesterday. I don't have anything else to add beyond that, but, again, wanted to acknowledge the feedback and see if there were more questions or feedback beyond what we talked about yesterday.

MEMBER DIMITRIJEVIC: So, I would like to provide, because I have thought about that in more detail since our discussion yesterday. This is Vesna Dimitrijevic.

And I said yesterday my main problem is that we often say the QHOs are -- let me find it in the preamble -- are well-established risk measures using risk-informed decision-making.

And as I said yesterday, I don't perceive that risk to be true. So, I was going to, you know, to propose something for consideration. Can you acknowledge that we don't have enough experience with

using QHOs because we use the substitutes, which are CDF and LERF?

And then, because, you know, 1.174 is becoming prominent residence there, I went to Reg Guide 1.174, which has the QHOs mentioned a couple of times. But in one very interesting paragraph on page 10, this is what 1.174 said:

"The use of CDF and LERF as bases for PRA acceptance guidelines is an acceptable approach for addressing Principle 4. Use of the Commission's Safety Goal QHOs in lieu of CDF and LERF is acceptable in principle" -- that's 1.174 -- "and licensees may propose their use." QHOs. "However, in practice, implementing such an approach would require an extension to a Level 3 PRA, in which case the methods and assumptions used in the Level 3 analysis, and associated uncertainties, would require additional attention."

So, I propose that this in some way, instead of saying, "Oh, we should state that we have a very limited experience with use of QHOs," that with the QHOs, that most of the experience, risk of replication today is based on such use of CDF or LERF, and that introduction of using QHOs directly introduces -- it will require use of Level 3 PRA,

which introduces all the new issues associated with the methods with the Level 3 PRA.

I think it will be fair to acknowledge that, instead of just ignoring that, pretending that we have experience with QHOs, which we don't. We have a very limited experience, even with the spent fuel pool, things we discussed yesterday.

So, also, the one additional thing which I wanted to mention is that QHOs are, basically, as defined in the Commission's statements, they are sort of quantitative objectives used to gauge achievement of the safety goals.

And as I proposed in my additional comments, which maybe I didn't formulate so well, it is, if you go to the safety goals back, you know, when you were just talking about, you know, increasing the risk in the qualitative bases, then you can open the door for somebody else to come with different quantitative objectives. Because, for example, the new applicants can consider the CDF is not necessary, when we can actually consider all the risks to the large releases. Or they can propose, you know, different safety study measures.

Okay. This is my discussion. My main point is I'd like to acknowledge that we don't have

experience with QHOs; that all of our risk-informed experience is based on substitutes, and the use of QHOs introduces the new issues. That's it.

MR. JESSUP: Thanks. I'll probably defer to Bill Reckley on that point.

MR. BLEY: Bill, before you go ahead, let me --

MR. RECKLEY: Yes. Yes, Dennis.

MR. BLEY: -- add a little question to that.

In your response to our last letter, you didn't defense use of the QHOs very strongly. You fell back on the 1.174 idea that it's part of an integrated decision process. So, it's one out of four or five criteria one looks at.

You buried us in material. So, I haven't found my way through to see if you actually say that somewhere in the rule language. I didn't remember it having been there.

Are those arguments somewhere in the rule now or in the statements of consideration?

MR. RECKLEY: Yes, that discussion is in the preamble. We can take a look. Again, we'll acknowledge, as the discussion was yesterday, the further you go into these modelings, every time you

introduce one, you're increasing the uncertainties. So, generally, the lower the frequency, the higher the uncertainty and the higher the consequence, the higher the uncertainties.

But we will take a --

MEMBER DIMITRIJEVIC: All right, but this presentation, I mean, a lot of the goal of 10 to the minus 6 is equally low. This uncertainty comes from totally different matters using Level 3. So, that's my point.

MR. RECKLEY: Right, right.

MEMBER DIMITRIJEVIC: This is general uncertainty of the lower numbers in the PRA. As I said yesterday, this is very well-stated in 1.174, and I was very nicely surprised when I found it last night. It exactly says that you are introducing new methods, new uncertainties. Please keep that in mind. So, if you want to propose using QHOs as one of the options, then we should acknowledge that.

MR. RECKLEY: Yes, we'll take a look. In my mind, we addressed this because we talk about the need to address the uncertainties. And that would be the uncertainties that's introduced by not only modeling the plant and the frequencies, but also when you get to offsite doses, the uncertainties associated

with that.

But the --

MEMBER DIMITRIJEVIC: But you also state in the preamble that these are well-established cumulative risk measures, which is not true.

MR. RECKLEY: Well, the risk measures themselves have been around since the 1980s. So --

MEMBER DIMITRIJEVIC: Risk measures of CDF and LERF, but not QHOs.

MR. RECKLEY: Well, the QHOs have been around since the 1980s.

MEMBER DIMITRIJEVIC: They have not. They have been introduced in this NEI statements of, you know, this 2 to the minus 6 and everything.

MR. RECKLEY: No, no, no. No, no, that --

MEMBER DIMITRIJEVIC: But the safety goal -- this is where we have a major disagreement. I say one thing; you say the other thing.

MR. RECKLEY: No, no. And I'll just say NUREG-0880 -- I think the number is right; Marty, come to my rescue if I've got the number wrong --

MEMBER DIMITRIJEVIC: No, this is very true, but they're not in the -- well, you know, they're not in the safety goal, as you point out. You make them as to be a Bible to this thing. And I'm

just saying something which I think you do have to agree with me: that 99 percent of our risk-informed experience up to this moment is based on substitute measures, CDF and LERF.

MR. RECKLEY: Yes. Yes, totally agree with you, that's what's --

MEMBER DIMITRIJEVIC: And the substitute measures have been there before QHOs. Do you agree with that?

MR. RECKLEY: The use of CDF and LERF was --

MEMBER DIMITRIJEVIC: Yes. This was 1400, which is 1974.

MR. RECKLEY: Sure.

MEMBER DIMITRIJEVIC: So, you do agree with me there. There wasn't the QHOs, and then came CDF and LERF. It was CDF and LERF, and then, connection was made in that NUREG, which I questioned logical that connection, so yes.

MR. RECKLEY: No, no, we're talking different NUREGs. NUREG-1860 did --

MEMBER DIMITRIJEVIC: Right.

MR. RECKLEY: -- the exercise that we talked about. I'm just saying the qualitative goals themselves, the 2 times 10 to the minus 6 and 5 times

10 to the minus 7 for prompt fatalities, those numerical measures were in the 1980s. They were calculated in a NUREG that came out in parallel with the Safety Goal Policy Statement.

And so, those numbers -- I'm not arguing with you that doing the analysis to compare to those numbers is difficult. Fully agree with you.

MEMBER DIMITRIJEVIC: I just, not to say they have actually proved their base that 10 to the minus 4 CDF, right, which was used before, and they want to say that corresponds to possible, you know, the cancer deaths. Even I'm just totally questioning the connection between CDF and cancer deaths.

But this is irrelevant. Let's not go into the details. I'm sure that both of us are ready for minutia what was done in --

MR. RECKLEY: Right. At this point --

MEMBER DIMITRIJEVIC: It was in 1980, it says .1 of the risk. You know, it doesn't say 2 to the minus 6, those things.

MR. RECKLEY: Right. Right. But the NUREG that came out in parallel with the Policy Statement took that 1/10th of 1 percent, which is in the actual Policy Statement; you multiplied that number by the risk of getting cancer from any other

reason, or the reason to die by accident for any other reason, and it gets you the 2 times 10 to the minus 6, or 1 times 10 to the minus 7 numbers.

I'm just saying those numbers themselves, I'm agreeing with you they weren't used very much because we were dealing with light water reactors and the measures were core damage frequency and conditional containment failures, yes, but the numbers themselves came out in parallel with the Safety Goal Policy Statement.

MEMBER DIMITRIJEVIC: All right. So, I don't want to argue this with you. I have an idea about that.

MR. RECKLEY: Right.

MEMBER DIMITRIJEVIC: But I'm trying to make a different argument. My argument here is, if somebody now wants to use dose numbers because it doesn't have a CDF and LERF as substitute measures, then it introduces all new methods. And these methods, we don't have experience with. So, therefore, that should be considered in all of this, you know, when it comes to the technical adequacy of the risk analysis and everything.

So, my only point is, let's admit that we don't have experience with QHOs; that they will

introduce new methods. Because that's what the true statement is.

CHAIR PETTI: Okay. I think we understand ourselves. I mean, let's move on, or Bill will be here forever.

(Laughter.)

I do appreciate, though, Vesna -- I mean, when you quoted 1.174, I kind of looked at our comment and said, "That's sort of saying the same thing."

MEMBER DIMITRIJEVIC: Yes, absolutely.

CHAIR PETTI: Yes.

MEMBER DIMITRIJEVIC: Absolutely.

CHAIR PETTI: So, go ahead, Bill.

MR. RECKLEY: All right. I was just going to point out, as you go through and try to make it technology-inclusive and look over to the non-light water reactor PRA standard, which doesn't use the same terminology -- and again, Marty, weigh in, as needed -- but it does talk about using these other measures in that standard that we've endorsed in a Reg Guide for trial use.

MEMBER DIMITRIJEVIC: I was just going through that to find the references, and I will finish looking while we are talking.

MR. RECKLEY: Okay.

All right, Billy -- Bill. Sorry.

MR. JESSUP: Yes. Thanks. Good discussion.

Yes, thank you, Billy.

So, the second recommendation here from the fourth Interim Letter, it focused on the role of safety functions in both Frameworks. We touched on this a few times yesterday and noted that, in response to the recommendation, we did propose a definition for the term "safety function." We agreed that it's a very important concept that we wanted to ensure that we were clear on. And that definition, you know, it's found in Section 53.20 now, as Jordan Hoellman discussed yesterday.

And we also made some changes to the rule text that would add some more clarity around how safety functions are defined in each Framework, and those changes were really focused on Framework B, where we see them implicitly addressed through the principal design criteria. But, again, as I mentioned yesterday, we worked to make that relationship more explicit, so, again, that we could add some clarity around this.

I don't have much --

CHAIR PETTI: I liked what was done, Bill.

I thought it helped on the clarity side.

MR. JESSUP: Okay. Now, thank you for that feedback, Dave.

I'll add that we did spend a lot of time with this recommendation because we appreciated it, but trying to find the right way to do it, we think we struck the right balance and tried to get the point across.

So, Billy, if you want to move to the third item, the next slide? Okay, thanks.

So, this recommendation focused on pre-application engagement, and it recommended several activities to be required as part of pre-application engagement and the process that we use to engage with reactor vendors and prospective applicants.

But, as the letter indicated, the staff is working on guidance in this area. We do have a draft white paper that is publicly available, and it summarizes the recommended pre-application engagement activities and the topics that we think are important enough, such that they should be discussed with the staff early in the process.

And a lot of those topics are aligned very closely with what the Committee had recommended, and you see a handful of them on this slide. These are

from that draft white paper on pre-application engagement, principal design criteria, selection of licensing basis events, SSC classification, Probabilistic Risk Assessment, among others.

And we did add a note that we agreed with the ACRS on this topic, but noted, again, that pre-app engagement, it can't be required of the developers and the prospective applicants, but that draft white paper certainly encourages it, and we use it quite often in discussions with these groups, when they're coming. And I personally use it a lot in these engagements.

MR. BLEY: All the applications we've received, you've had extensive pre-application interactions, isn't it true? That's with smaller reactors, yes?

MR. JESSUP: I would offer, Dennis, that it's varied. You know, there's a couple in-house right now and it's varied, and it continues to vary with prospective applicants today, not the ones that are in-house that you just referred to. But it varies.

It's very helpful. As I indicated, it helps us get through a lot of tough technical and policy issues, not necessarily resolve them, but at least identify some of the sticking points early.

MR. BLEY: Okay. You envision you might get some applications with, essentially, no pre-application engagement? Is that what you're saying?

MR. JESSUP: I would say it's possible because it's not required.

MR. BLEY: Yes.

MR. JESSUP: And I think that, right now, that draft white paper, it really outlines not only some of these technical topics, but the benefits and potential schedule impacts are addressed in there as well.

CHAIR PETTI: So, Bill, the draft white paper, is it available to applicants? Is it on our website somewhere?

MR. JESSUP: It is, Dave. Actually, I Google it sometimes when I can't find it right off the bat. Yes, it's on the NRC's Advanced Reactor Pre-application website, public website.

CHAIR PETTI: Okay. Good.

MR. JESSUP: And if you don't have the Accession Number, we can get it to you.

CHAIR PETTI: I mean, here is a case, yes, I don't want to get hung up on what it should require. You guys understood our intent. I think you were on the same page. The fact that there's a white paper

out there for applicants to avail themselves of, you know, that's getting 90 percent of the way there, in my opinion.

So, thanks.

MR. JESSUP: We were definitely in agreement with ACRS on this.

Billy, can you move to the next slide, please? Our slides are hung up. Okay, there we go.

So, the fourth recommendation, it focused on ensuring that fire protection requirements in both Frameworks were technology-inclusive. This is a pretty straightforward response. We agreed with this recommendation, appreciated it. It brought up some good points.

And I touched on some of the actions taken in this area yesterday, specifically, the fact that major changes were made to the Framework B preliminary proposed requirements in this area. They align a lot more closely with Framework A. And those changes, they inherently address the recommendation, and we feel confident that what's currently proposed in both Frameworks is now technology-inclusive.

So, Billy, can you go to the next slide, please?

So, this was the kind of fifth

observation, I'd call it. And it focused on the length of the preliminary proposed rule text and noted that some of the text could be placed in guidance, and also pointed out the optics associated with the length of the rule, and that this could cause future issues around usability.

I think we touched on this briefly yesterday morning during kind of what I would call the general session. I'd say we've worked diligently to identify areas where some of the rule text may be more appropriately addressed through regulatory guidance. I mean, fire protection in Framework B is just one example.

And I think the discussions today and yesterday reflect that consideration, and I mean, probably over 50 percent of the time we spent talking about guidance. And we definitely agree that having a rule that's as streamlined and efficient as possible is a prime objective.

I think I want to come back to an item that Jordan Hoellman discussed yesterday regarding Section 53.10. And that's a new section relative to the previously issued iterations of the rule text. That section, it's small, but it's important, and it establishes the independence of the Frameworks. And

I think it reinforces the need to look at the Frameworks independently, notwithstanding that there are a few ties between the Frameworks, but not a lot. And that was done intentionally because of that tradeoff between, you know, what I would call volume and usability or clarity that we've worked through.

And then, you know, if you get to the last bullet here, if you look at both Frameworks independently and you consider the preliminary proposed rule text in Part 53, it would, essentially, provide an alternative or provide alternatives to the regulations in Parts 50, 52, 55, and 100, then you see that either Framework actually is substantially smaller than that existing set of requirements.

And so, I think, to sum it up, we agree that the rule needs to be efficient, needs to be clear, usable, but we also note that, if you look at each Framework independently, again, it suggests that what's been developed so far, it should be considered quite compact, given the appropriate context and, you know, appreciating the fact that it would provide an alternative to a large body of existing requirements.

CHAIR PETTI: And, Bill, I think in this area, you know, the response to the letter just didn't speak to me as well as the meeting we're having here,

where, in fact, you guys kind of have your hat on, looking for inefficiencies and duplication. Just, in fact, that all of the stuff that Jesse talked about in Subpart P just as one sentence saying, "Go back to Subpart F for the requirements," I mean, you're looking for ways to try to streamline it, and that didn't come through in the response to the letter. So, I think you understand our concern and you're on the lookout, if you will, to try to do that, in light of the other constraints you have.

MR. JESSUP: Agree, Dave. I appreciate that feedback, not only the positive feedback, but also maybe that the letter didn't come through as clear.

And I'll say it probably for the third time, we did look at various ways to try, when we introduced Framework B, in particular, to try and make it as streamlined as possible, all the way to, do you just make several forks in the road in Framework A, or do you, like I said, try to increase the usability, the clarity, by some duplication, but, again, you have kind of a standalone set of requirements now in those Frameworks.

So, appreciate the feedback.

Billy, can you go to the next slide,

please? Thanks.

So, the sixth recommendation, this focused on the generally licensed reactor operator concept and how operating licensing requirements have been proposed in Part 53. I think Jesse Seymour covered this better than I would this morning. I think Jesse had a dedicated slide on this. So, I wasn't going to go into any great detail on this, except to point out some of the highlights that, again, are probably duplicative of what Jesse said this morning.

What's been proposed, they're technology-inclusive. They have significantly more flexibility than what's currently out there, and I think the last bullet is what always sticks with me, in that it should reduce the need for exemptions from what folks would have to take to the current requirements while enhancing reliability and clarity.

So, I don't want to repeat what Jesse said. And, Jesse, feel free to jump in, if you're on.

But I'm glad to take more questions on this one, if needed.

MR. SEYMOUR: No, Bill, again, I think we talked through those items today, and also, we've responded to them directly, some of the earlier items, in past discussions. So, unless there's further

questions, I think we've covered it.

MR. JESSUP: Thanks, Jesse.

Billy, you can go to the next slide. Okay.

So, the seventh item here, a recommendation/observation. This was focused on SSC classification, and the feedback was that, through the use of PRA, perhaps only two classes of SSCs should be developed.

We thought the discussions during the summer meetings on this topic were really good, and we appreciated the insights, but I think, as you saw in the letter, after we went back through the feedback we got and saw the letter, the staff thought that two classes may be a little too limiting, in light of the fact, especially, if you see the last major bullet there, that there are some non-safety-related SSCs that may warrant some type of special treatment due to their role either in providing increased defense-in-depth or that they're otherwise risk-significant. And this generally gets reflected in a third class of SSCs.

And we noted here on the slide how those considerations, they're reflected in the current rule language or the proposed rule language, where

Framework A, it's somewhat more explicit, in that, with that third class, the non-safety-related with special treatment, but it's also reflected in Framework B in a couple of ways.

You see important to safety on here, but also in some specific areas, such as the SSCs that are used to mitigate additional licensing basis events that Boyce discussed yesterday. So, the treatment of that third class or third tier in Framework B, although not explicit, is fairly consistent with the existing requirements that we have today.

And I skipped the second major bullet that we had a note here about safety-related SSCs, where we pointed out that both of the Frameworks, they address this class of SSCs generally in a manner that's consistent with what's in the current regulatory requirements. The wording is a little bit different, obviously, between the Frameworks, but, in any case, we think they're fairly consistent.

MEMBER DIMITRIJEVIC: So, let me just ask you a question for Framework A, which is totally PRA-integrated. Are the PRA results considered in this safety classification?

MR. RECKLEY: Primarily -- the answer is yes -- and primarily in the second category, the non-

safety-related, let's say, safety-significant or using the NEI 18-4 terminology, non-safety-related and special treatment.

MEMBER DIMITRIJEVIC: But my question is, when you do safety classification within safety-related and non-safety-related, was the PRA considered as part of that classification?

MR. RECKLEY: It is somewhat indirectly. The PRA under Framework A, as it is under the Licensing Modernization, the PRA would inform how you pick the design basis accident. Once you've picked a design basis accident, the requirement is the same, that you use safety-related SSCs. But the actual design basis accident is a stylized evaluation similar to what is done now. So, it kind of becomes separated from the PRA, but the PRA is used to inform the selection of the DBA.

MEMBER DIMITRIJEVIC: But that's where our comment comes. If you use our PRA, you shouldn't have something important for safety which is non-safety-related. That's when if you have -- in a perfect world, this would be the case.

My other question is, if you are not having a perfect world, what is the position on safety-related which are not important for safety in

the Framework A?

MR. RECKLEY: The general notion in Framework A -- and this is talked about in LMP -- is you should avoid that. You should be able to avoid that case. And there's a whole part of the Licensing Modernization Project that is separate from the NRC in terms of its implementation and just reflected in white papers, basically, to help users implement it.

But there's a whole section on smartly picking your safety-related SSCs specifically to avoid what you're suggesting. And so, I think --

MEMBER DIMITRIJEVIC: Well, see, my position is -- and this is just my, but, actually, the Committee has some similar position -- that in the Framework A, there should be only two categories. You should do this integration during the safety classification. In that Framework B, you should have all four categories.

And then, let me ask you something totally separate from the categorization. Did you define "special treatment" in the QA programs?

MR. RECKLEY: The special treatment can, but does not necessarily have to include QA requirements. Special treatment could be additional monitoring. It could be -- it's really up to the

designer to evaluate what that --

MEMBER DIMITRIJEVIC: So, do you have discussion of this in Subpart F? I couldn't find it? You know, in the part of the --

MR. RECKLEY: The details of this show up in the Regulatory Guide, in 1.223 and NEI 18-04, in the guidance documents.

MEMBER DIMITRIJEVIC: I just thought there is -- did they make it to the other parts of 53?

MR. RECKLEY: No. That's in --

MEMBER DIMITRIJEVIC: All right.

MR. RECKLEY: It's primarily in the guidance. And this does largely fall out of the -- if you look, for example, at NUREG-1860, or some other thoughts about how you grade the requirements base on the risk or safety significance of SSCs -- but when you introduce Appendix B and safety-related and a traditional approach for some subset of SSCs to fall into that category, as Bill Jessup had mentioned, it will largely result in the need to have an additional category where we say, we acknowledge its importance, but it doesn't need to fall into the requirements of the QA program in terms of the procurement and all of the other criteria that are listed in order to serve its function in terms of providing defense-in-depth.

The trap is, if you have only two categories and safety-related is one, and you apply Appendix B to all of that equipment, that has ramifications in terms of the regulatory impact and the cost of the regulation for those designs. So, that's why we generally introduce the third category, is to address risk in a more efficient manner.

MEMBER DIMITRIJEVIC: Well, as you're familiar in application of 50.69, the cost is actually reduced because there is much more SSCs in the category which is not safety -- which is safety-related, but not safety-significant. And this is why this, to me, looks like a chair with, you know, three legs, what you have here. This is totally, you know, it looks like -- it lacks total knowledge, what we are doing here.

I mean, you know, because if you look at in the reg of 50.69 application, most of the current safety components, you know, there is some of them which are non-safety, but safety-significant, but a much larger number is the safety, non-risk-significant, which, in general, reduces the cost. And this is why so many plants are interested in using 50.69.

What you have here is some hybrid, shaky

hybrid. I mean, it doesn't make sense to me. So --

CHAIR PETTI: So, Bill, I'll give you the counter to that, because you probably heard lots of discussions we had in August on this. July we had the meeting.

My view is the goal would be to try to have a system that didn't get you into the situation where the classification rule set made you classify something as having some safety significance, but it really had no risk significance, when one looks at it through a PRA lens. And there's costs associated, obviously, with seeing something as safety significance when, in fact, it may not have any risk significance.

In my mind, this is all about we need a system that optimizes the safety footprint for these newer reactors, but we've got no operating experience in many cases, or limited in others.

How do you know what's important? How do you know what to worry about, so that both the licensee and the regulator can focus on the right stuff and not peripheral things? And that's really, I think, sort of what the intent of what we're -- at least when I looked at the finding that we put in, that's what I where I was going. That was the

important sort of thought process.

MR. RECKLEY: Yes, and I think the way I would answer, the way we're trying to do that is the way we've laid out the requirements in both Frameworks. But in Framework A, to do the PRA, in order to search for that, to do -- again, it goes back to the observations that have been offered by the ACRS numerous times about doing these systematic assessments. And both Frameworks have to do that. They do it slightly differently, but you do these systematic assessments, and then, with the whole goal of identifying what's important to managing the risks associated with those facilities.

And again, once you then say you're going to address at least a subset of those using a traditional approach, and bringing in the quality assurance requirements, and so forth, and that's the safety-related component, but experience has shown you also have SSCs that are contributing to the risk profile, that you want to have some controls over -- and again, Boyce talked about, under Framework B, the historical for light water reactors of being a few events, and then, supplementing that with severe accidents, and so forth.

All of those things were done under this

third category, if you will, of special treatment, but not running up the cost by designating them as being safety-related.

And the same thing is done in Framework A where you look at the risk and you say, if it's contributing to the risk profile, controlling the frequency or the consequences of event sequences other than the DBAs, or providing defense-in-depth, then it warrants some kind of special treatment.

CHAIR PETTI: Yes, I'm worried about that fourth option in 50.69, and maybe that's just an historical artifact because PRA wasn't around when many of the plants did their classifications years ago.

MR. RECKLEY: Well, yes, you do have to be a little careful. 50.69 is built for plants that were designed and built already, using a set of requirements, and then, saying, "Now, let's do an overlay considering risk and see if we can justify a slightly different treatment."

And so, you do get to a different place when you apply these kinds of methodologies for plants that have already been designed and built compared to those that you're designing from scratch. And hopefully, you can avoid some of the pitfalls, like

having safety-related, but non-risk-significant SSCs.

CHAIR PETTI: Right. No, that was my point, was I couldn't, in my mind, understand why, except that it existed, why you decided to take the classification for 50.69, given that historical context, for Framework B, when you're looking forward, when you've got these things occurring at the same time, right? The PRA and the classification can be used in concert, so that you don't have that problem. That's what, mentally, I couldn't get around, why carry that forward, except that it's something that's been around and people know about.

But this discussion helps.

MR. RECKLEY: Bill Jessup, sorry, back to you, well, both for that last question or observation and back to the presentation.

MR. JESSUP: Okay. I don't think I've got anything else to add, though it's good feedback. It's an area that we, obviously, have thought a lot about.

But, Billy, I guess you can go to the last recommendation on the next slide. Okay.

Yes, so the last recommendation from the fourth Interim Letter, this related to documentation of the basis for the AERI entry criteria. And this was pretty straightforward.

The staff agreed with the recommendation. We're currently working on identifying the right format for documenting that basis, and that would include the MACCS validation that was discussed yesterday during the afternoon presentation.

So, that covers the eight observations/recommendations from the fourth Interim Letter. Absent any other questions, I'll turn it over to Jordan Hoellman on the next slide.

MR. HOELLMAN: All right. Good afternoon, everyone.

This is Jordan Hoellman, Project Manager in the Advanced Reactor Policy Branch.

I'm going to cover major industry feedback received on Part 53 so far and guidance initiatives, and then, sort of how they fall in the process to try to add some more clarity around where we're going with certain guidance documents.

So, this slide is similar to one that we presented to the ACRS in May of this year. It details some of the comments we received from industry, some of which overlaps with the feedback we received from the ACRS. And it mostly covers topics where we've made an active change and tried to address the feedback. So, we talked a little bit about these

throughout the presentations the past two days, but I'll try to cover it quickly here.

So, we got some feedback that there are programs that are duplicative of each other and sometimes overlapping. What we've done is we've provided some additional flexibility for licensees or applicants to organize and combine programs, as appropriate to avoid duplication.

With manufacturing licenses, from talking to some potential applicants, we recognize the potential for using a manufacturer's license to fabricate a nuclear reactor and the potential for fuel loading in the factory. So, we've enabled that in both Frameworks.

We've already talked about the two-tier safety criteria that was causing confusion amongst a lot of stakeholders. So, we've eliminated that, and we discussed that before.

For quality assurance requirements, each Framework has their own Subpart that covers QA, and we've consolidated them in their respective Subpart in each Framework and aligned them with Appendix B to Part 50.

Industry stressed a number of times that consistency in the QA requirements was essential for

suppliers that already comply with the requirements of Appendix B. So, we wanted to acknowledge that and ensure that consistency continues Part 50, Part 52, and Part 53.

Another things just with codes and standards in general is we've enabled some flexibility in using codes and standards. We defined consensus codes and standards in Subpart A and sort of allow for, you know, require the use of generally-accepted acceptance codes and standards, but don't specify them as is done in Part 50.

For normal operations, towards the beginning of our development of Part 53, some of the requirements for normal operations were sort of intertwined with the requirements for licensing basis events. So, we do couple them to provide some clarity.

And then, we've already discussed the safe, stable end state conditions which was one of ACRS's recommendations and, also, a comment received from industry. So, we've added that requirement and made clarifications, as appropriate, in the preamble.

So, Billy, if there's no questions, let's move to slide 167.

The first item here is the comment we've

been receiving that Part 53 should only contain one Framework that is methodology-neutral. What we've done in Part 53 for the Draft Proposed Rulemaking Package is created two distinct Frameworks within Part 53 that we think provide clarity and predictability for applicants using a variety of approaches.

We've developed the Draft Guide 1413, which, hopefully, provides potential applicants some additional guidance on choosing which Framework to pursue and, also, developed the AERI approach and the accompanying guidance for that methodology.

Some external stakeholders questioned ALARA in the regulations and as a design requirement. The staff has included Part 20 references in Part 53. We tried to recognize that we're looking for a combination of design features and programmatic controls to fulfill ALARA requirements.

And also, as the Advanced Reactor Content Application Project continues, we've tried to provide guidance and ISGs associated with that. That makes that more clear and sort of gets -- well, it hopefully addresses some of industry's concerns about our overburdening them in the review, I guess.

For special treatment, this is what we were just discussing some moments ago. So, I'm not

sure I need to cover that more.

Facility Safety Program, this is a new program with no equivalent requirement under the existing regulations. Industry had commented that this is an increased burden and unnecessary.

The staff views the Facility Safety Program as a potential operational benefit. It allows the continued use of PRA for evaluating changes, managing risk, and improving the relationship between NRC's licensing and reactor oversight programs.

Because we've gotten many comments on the Facility Safety Program, we did provide questions in The Federal Register Notice, and specifically, request for comments, to see what additional insights we can get during the public comment period.

And then, lastly, more guidance is needed to clarify the regulations.

So, the staff agrees and we've been trying to align with industry on future guidance needs to ensure we know what different industry groups are pursuing and may request NRC endorsement of. And we continue to do that in our periodic advanced reactor stakeholder meetings.

For example, we have prioritized the Technology-inclusive Content Application Project and

Southern Nuclear-led effort for technology-inclusive, risk-informed, change evaluation process, which are the follow-on phases to the Licensing Modernization Project methodology.

We've also gotten comments around chemical hazards. And so, that's an area where we think we need additional guidance. And as we discussed yesterday, areas surrounding manufacturing and manufacturing licenses is an area where we think additional guidance would be beneficial.

CHAIR PETTI: So, Jordan, just a question back on the Facility Safety Program. You say it allows continued use of the PRA, et cetera, et cetera. You could do that today without the Facility Safety Program, is that true?

MR. HOELLMAN: It is true. I think what we thought, in at least Framework A, because the PRA provides such a leading role in the licensing, and with the required upgrades to the PRA, we thought, you know, potentially, as the number of reactors potentially can increase from the hundred maybe we have now to potentially many more than that of these advanced reactor designs, we thought that allowing an applicant to implement this program, instead of having the NRC have to take generic actions and assess things

generically across the operating fleet, it would be potentially a more efficient way to address risks as things are identified.

And we do have efforts underway to sort of modernize our construction oversight and inspection programs. And so, that's one of the areas I think we're thinking about, as we're soliciting specific Requests for Comments on the concept.

CHAIR PETTI: Yes. When you say that, I remember Bill Reckley telling us this sometime in the past. To me, that's probably the stronger rationale for it than what's in the slide. At least the slide doesn't speak to me like what you just said. That's all.

Thanks.

MR. HOELLMAN: No, I'm glad I could clarify that for you.

So, if there's no more questions, I guess we'll move to the next slide, 168.

So, this is industry feedback we received on Framework B, or more recently this summer after Framework B was released. Some of this is not only applicable to Framework B, but to the entirety of Part 53.

So, we got some comments that chemical

hazard requirements are unclear. We've tried to amplify this in the preamble. And chemical hazards in question would include substances commingled with the licensed material or those produced by a reaction with licensed material consistent with similar requirements in Part 70.

So, we think the Standard Review Plan for fuel cycle facility license applications in NUREG-1520 provides a good basis for how we would anticipate addressing this. And like I mentioned on the previous slide, when we talk about additional guidance, it is an area that we're thinking we'll need to develop in the future.

We got some comments that the rule language is not technology-inclusive in some areas. And so, you know, as one of the main objectives of the Part 53 rulemaking, we appreciated that comment and took actions in certain places to revise sections to make it technology-inclusive. And that one is more specific to Framework B, where our starting point was the existing requirements in Part 50. So, there were some places where I guess we missed some of the light-water-reactor-specific elements.

We got comments that PRA development -- oops, Dennis, did you have something?

MR. BLEY: No, sorry, I left my mic on by accident.

MR. HOELLMAN: Oh, okay, no worries.

So, on the third line there, we got comments that PRA development at the construction permit stage is not reasonable. Here, we intended to align with the Parts 50-52 rulemaking. We do recognize that -- and industry reiterated at our periodic advanced reactor stakeholder meeting last week that -- this is a major industry comment for both the Parts 50-52 rulemaking and Part 53.

So, we're trying to maintain consistency with the 50-52 rulemaking and other Commission policies. And, you know, depending on what the Commission decides on 50-52 and Part 53, we'll continue to follow Commission direction there.

I would note that we are developing guidance. It's going to be called -- or it's related to the non-light water reactor PRA standard, and we are developing guidance that sort of walks through the requirements of the standard and sort of tries to clarify when certain requirements of the standard are applicable at different stages of the licensing process. So, it would provide at least a staff position and be subject to public comment, like all of

our documents, but add a little bit of clarity on what we think is expected and can be done at a CP stage versus an OL stage, and all the other licensing processes as well.

But that, just to get it on your guys' radar, I guess, because, like all of our guidance documents, we need to coordinate with you and see if that's something that you're interested in reviewing.

And then, we got comments on the proposed entry conditions for AERI, that they are too conservative or too restrictive. As was mentioned yesterday, the main point here is that AERI entry conditions are intended to distinguish between plants with a relatively straightforward design versus plants with more complicated designs. So --

CHAIR PETTI: So, Jordan, just a question on that. That industry feedback was before the new language in Framework B, where there's now this discussion of passive and inherent features that we have to be able to deal with? When they said that, were they just worried about the 1 rem, that being too conservative? Had they seen the other language?

MR. HOELLMAN: They have seen the other language, and I'll let Bill or Marty correct me, if I'm wrong. But I still think that we're getting this

feedback. So, I don't know. Marty or Bill, do you want --

CHAIR PETTI: No, that's all right. I just wanted to understand because, you know, everything's on a timeline here.

MR. HOELLMAN: Yes, right, right.

CHAIR PETTI: Yes.

MR. HOELLMAN: But this is the slide consistent with what we've presented at the advanced reactor stakeholder meeting last week, which occurred after the release of the Draft Proposed Rulemaking Package.

CHAIR PETTI: Thanks.

MR. HOELLMAN: Mm-hmm. Any other questions here? Okay. Let's move on to 169, which is sort of the guidance landscape that we're sort of dealing with in Part 53 space.

So, for everyone's reference, if you haven't got a chance to look at it yet, applicability of guidance can be found in Enclosure 1B to the Rulemaking Package.

Under existing guidance -- I'm not going to spend a whole lot of time going back and discussing the non-light water reactor vision and strategy document and the implementation and action plans that

were developed in the 2016 and 2017 time period.

But, if you recall, at the time we were focusing on licensing non-light water reactors under the existing regulations. So, I think we discussed a little bit yesterday that's why, you know, some of the documents, the applicability is limited to non-light water reactors and things like that.

Per recommendations -- oh, Dennis?

MR. BLEY: Yes, the ones that are labeled "near-term" --

MR. HOELLMAN: Mm-hmm.

MR. BLEY: -- how near-term do you think those are? Or is it spread all over the map?

MR. HOELLMAN: It's spread all over the map, but relatively near-term. Like TICAP/ARCAP, I think that the latest expectation for that to be issued for public comment is either this month or early next month.

For the non-light water reactor PRA standard, we have the trial Reg Guide available. I mentioned the non-light water reactor PRA standard applicability ISG. That is under development and undergoing some preliminary management reviews now.

For the endorsement of ASME Section III, Division 5, we presented to ACRS on that last summer.

That's working through the final stages to be issued as a final Reg Guide 1.87, Revision 2. That should happen either this month or next month.

The endorsement of ASME Section XI, Division 2, which Ron was talking about yesterday, we're just sort of in a waiting period with OMB for that one, where they've got to clear the 50.55(a) rulemaking because that one sort of touches on 50.55(a) and the revision to that rule.

The molten salt reactor fuel qualification, that one I think ACRS reviewed the draft of that NUREG last fall, I want to say, similar to the NUREG-2246. I think it was in the same time period. So, that one is scheduled for issuance the end of this year.

Seismic design and seismic isolators, we've just issued as a draft white paper to engage stakeholders last week.

MR. BLEY: That's interesting. We had drafts a while back. So, that's gone out to stakeholders. Are you bringing that one to us anytime soon? We had some interest in that.

MR. HOELLMAN: We need to get on your calendar, yes.

(Laughter.)

MR. BLEY: Okay. Because there's quite a bit of interest in that one, I think.

MR. HOELLMAN: Mm-hmm, yes.

For emergency planning, we provided, I guess it's the final rule, to the Commission at the beginning of the calendar year.

The change evaluation is sort of phase 3 to the Licensing Modernization Project. That one, NEI -- or I mean Southern provided us a draft. I think they plan to request NRC endorsement next calendar year, but that will be similar to the LMP and TICAP effort, where they're provide to us as an NEI document for endorsement and an NRC-issued Reg Guide.

QA alternatives is something NEI has taken the lead on to try to -- and this is sort of generic to Appendix B -- but to look at the ISO standards and sort of help -- well, provide guidance on how the ISO standards can be used to meet Appendix B.

MR. BLEY: Have you been -- that's one I haven't heard a whole lot about; I've heard a little about. Are you going for --

MR. HOELLMAN: Yes, I haven't been direct -- oh, I'm sorry, Dennis, I'm talking over you. Go ahead.

MR. BLEY: No, go ahead. I said I haven't

heard much of anything on that one, except the concept floated out there.

MR. HOELLMAN: Right. I mean, so this was an interesting comment that we, I think, have been almost receiving from the beginning of the Part 53 rulemaking effort. I haven't been directly involved in it, either. So, I'm not sure I'm the best to answer any questions regarding it.

But I would assume that whenever they get to a place where it's ready to be submitted to us for potential endorsement, we'd get there. But it's more generic to touch Part 50, Appendix B, you know, along with --

MR. BLEY: It's going to replace that or --

MR. HOELLMAN: I'm sorry, what's that?

MR. BLEY: This work might lead to something instead of Appendix B, an alternative? It is an alternative, then, to Appendix B?

MR. HOELLMAN: I don't know if it, I don't know if it's an alternative.

Bill, do you know?

MR. RECKLEY: Dennis, it would be an alternative to NQA-1, not to Appendix B.

MR. BLEY: Oh, okay.

And I think I'm going to ask about this schedule. The third one from the top, I didn't interrupt you there; I should have. The non-LWR PRA standard applicability ISG, that's separate from some draft guidance you have out on that? I mean, we saw draft guidance, right?

MR. HOELLMAN: You saw the Reg Guide endorsing the standard. What this ISG would do -- and I'm not an expert, but from what I understand and what I've seen -- the ISG would walk through the requirements of the PRA standard and sort of differentiate which requirements of the standard would apply at different stages of the licensing process or apply at the different -- like, for example, a construction permit applicant would be required, or we think that they should meet these requirements of the standard at the construction permit stage versus all of them at the operating license stage.

MR. BLEY: Okay. And the idea of getting it out as an ISG, instead of a Reg Guide, is to get it out quickly, so people will be able to look at it? And eventually, it will turn into a Reg Guide?

MR. HOELLMAN: Yes, it's --

MR. BLEY: NUREG?

MR. HOELLMAN: -- following a similar

process to what we've done with the ARCAP ISGs. I think, you know, there's some thought or expectation that at some point we would compile all this stuff into something like a Reg Guide or a NUREG, like the Standard Review Plan, something like that.

It's just that overarching vehicle hasn't been selected yet. So, as we're getting some of these things out in the near-term, we're issuing them as ISGs, and then, the idea would be to compile them all into something like the Standard Review Plan.

MR. BLEY: Okay. Two quick points.

It looks like the ones that will really, could really affect Part 53 are pretty well along, and the others maybe have a longer near-term development. And I think you had a couple left at the bottom before I cut in on you. Please go ahead.

MR. HOELLMAN: Yes, thanks, Dennis.

So, the Facility Training Program is another ISG. This one addresses -- I guess training programs are SAT-based training programs and intended to support early movers. So, from what I understand, we're expecting a Topical Report from X-energy in the near-term on not following INPO accreditation, and whatnot.

If there's additional questions, you know

we have our Human Factors Operator Licensing folks online.

But that one should be -- that one is around the corner, too. I think we're planning on discussing that at the next stakeholder meeting in December.

And then, the material compatibility ISG sort of covers some of the environmental conditions and different radiological concerns that ASME Section III, Division 5, just doesn't touch on generically. So, it's more specific to, or it's more design-specific. So, it goes into, like for a sodium fast reactor, consider these interactions, these environmental effects, that kind of stuff.

MEMBER BALLINGER: This is Ron.

What's the status of that?

MR. HOELLMAN: So, we plan to issue it as a preliminary Draft ISG in the near-term. Here, we're trying to get the final Reg Guide for the endorsement of ASME Section III, Division 5, issued before we issue that. But that's one where we want to get on ACRS's radar pretty soon, potentially, for a discussion early next year or next calendar year.

MEMBER BALLINGER: Yes, okay, but get with Chris Brown and get it on the schedule, because things

are filling up after -- after January is fine, I think, but --

MR. HOELLMAN: Okay.

MEMBER HALNON: Jordan, will you be adding Reg Guide 1.233 to the Part 53 box?

MR. HOELLMAN: Yes. So, this is sort of the complicated -- the situation we're in, I guess, at this point. The things in the existing guidance box, the darker blue color on the left, those are all guidance documents that have been issued. They're being used and implemented for applicants under Parts 50 and 52.

What we had planned to do with those is to make an update after the proposed rule is issued. It would then be issued for public comment. That would update the applicability for Part 53. We would bring it to ACRS, if you guys are interested in looking at it, and then, we would issue it for public comment. It would happen before the final rule is issued, so that the guidance document could be issued final with the final rule, if that makes sense.

Does that help, Greg?

MEMBER HALNON: Yes. So, in other words, don't look at the existing boxes being static? It's going to work with the rule.

MR. HOELLMAN: Yes, and the same thing applies to the near-term box as well.

As we work through the near-term guidance, one of the issues we found ourselves in is if we put applicability for Part 53 in these guidance documents, we cannot issue them as final guidance documents until the Part 53 rule goes final.

And we need these guidance documents to support our reviews under Parts 50 and 52 while Part 53 makes it through the process.

MEMBER HALNON: Good luck on keeping track of it all.

MEMBER BALLINGER: This is Ron. Going back to Section 3, Division 5, when we review that, Alloy 617 was not included and I pushed people on that because there is a code case for that now.

But I'm curious as to, as we go along, the number of materials that will be needed to be used at high temperature will increase. And these are not identified in Division 5 right now but they would be as soon as they get approved for use in Section 2.

So, how does that work?

MR. HOELLMAN: Ron, what we did, and just so you're aware, we did take on the review of Alloy 617. We issued Reg Guide 1.87 Revision 2 as a

supplement earlier this year that incorporated the Alloy 617 code cases.

So, when that Reg Guide gets issued finally, it will include those code cases and I would envision we do something similar as new materials are identified.

So, what we did with Alloy 617, we worked with a contractor, we reviewed the code cases, and then we incorporated the code cases into the Reg Guide issued for public comment, addressed public comments, and now we're getting ready to issue it finally.

So, it would I guess just continue to revise Reg Guide 187.

MEMBER BALLINGER: I'm ignorant, I have to go get that Revision 2. Okay, thanks.

MR. HOELLMAN: No problem.

I don't know if we alerted you specifically to that but I do remember in our presentation to ACRS last summer that was a comment I remember you making, and I remember we were in the process of pursuing the technical review of those code cases in parallel with the NUREG and Reg Guide issued.

MEMBER BALLINGER: Thanks, I've got to be a little bit more attentive.

MR. HOELLMAN: No problem.

Let's see, I talked about the near-term stuff, I talked about the existing guidance. I guess one thing to note is there are hundreds of guidance documents that exist for the current fleet of operating reactors.

While some of the guidance is specific to light water reactor technology, other guidance is technology-inclusive in nature and we think should be considered as applicants come in under the existing regulations.

For Part 53 guidance, we talked about the top ones today.

In addition to that, we're developing draft guides to support the rule text associated with Part 26 for the fitness for duty programs and fatigue management and for Part 73 on access authorization cybersecurity and security programs.

And then I alluded to with future guidance, we've identified some areas where we think guidance would be useful and needed. We've been aligning with industry to make sure we're not missing anything and try to make sure we're not duplicating efforts in developing guidance.

I think that covers the slide unless there are specific questions?

MEMBER BALLINGER: This is Ron again. Now I'm going to jump on your case. I just went on the website and Revision 2 is not there. I was on the public website so maybe it's somewhere else but right now the only thing that's there is Revision 1.

MR. HOELLMAN: Revision 1 to the draft reg guide?

MEMBER BALLINGER: Okay, to the Reg Guide itself. I've got to look at draft guides.

MR. HOELLMAN: Draft Guide 1380 and it probably should be Revision 1 because Revision 0 would have went out without Alloy 617.

MEMBER BALLINGER: Draft Guide 1380, I'll continue my quest.

MR. HOELLMAN: I really hope you find it.

MEMBER BALLINGER: I'll find it eventually or else somebody smarter than me will.

MR. HOELLMAN: If not I can send it to you.

MEMBER BALLINGER: No, I'll get it.

MR. HOELLMAN: Are there any other questions on guidance? I know I've been looking through some of the old letters from ACRS. I remember seeing something that talked about the associated design-specific guidance would be difficult to track.

And so this is sort of our effort of hoping to keep everyone on track.

MR. BLEY: Thank you.

MEMBER BROWN: Dennis, are you done?

MEMBER BALLINGER: I stand corrected, I found it.

MR. HOELLMAN: Great.

MEMBER BROWN: This is Charlie Brown, I guess I just realized something.

As we've gone through there I was going through the two frameworks again. We've talked about how they have to develop principal or functional design criteria, however those are defined.

And I'm kind of parochial, as most of you probably know by now, there's not a single reference in either one of these documents that provides any design criteria or standards or references any standards like the old IAAA standard 603 1991 for the fundamental principles of designing INC equipment for digital INC or any other type for these things.

So, it's all up in the air, the only references to those documents are relative to quality and quality control and qualification standards for those two sections in 279 and 603-1991.

So, I guess it's the intent of you all to

have absolutely no guidance at all, you're just going to fight it out when they come in with something made out of peanut butter and toothpaste?

I'm being sarcastic right now a little bit.

MR. HOELLMAN: I understand, Charlie.

MEMBER BROWN: I understand but there's nothing in there.

MR. HOELLMAN: As you recall probably, we came to ACRS maybe two years ago to talk about the design review guide for non-light water reactor technologies.

Maybe this is a good time to move to the next slide because the TICAP and ARCAP guidance that really point to this integrated webbing of the various guidance we've developed over the years, and I guess more specifically since the issuance of division strategy and implementation action plans.

Within the ARCAP ISGs, there is an ARCAP roadmap ISG that includes references to various guidance documents that are out there and that design review guide is specifically referenced in the INC portion of the application.

MEMBER BROWN: In the INC part of the application, what do you mean, their application, the

Applicant's application?

MR. HOELLMAN: Yes.

MEMBER BROWN: There's nothing in the rules anymore, is that correct? Two years ago, I have to admit, it's been far better coordinated based on what we're seeing now and the presentation as you've got it today, yesterday and today.

It was somewhat more disjointed two years ago. You all were developing it, we were reviewing it on the fly is what I would say, which I'm not complaining about it, that's where we were at the time.

And so I totally forgot that now we're relying on these other documents somehow. I didn't go try to key word all the TICAP and ARCAP, are they referenced throughout this? I didn't do that again.

MR. HOELLMAN: They're not referenced specifically --

MEMBER BROWN: In the rules.

MR. HOELLMAN: They're referenced in the applicability of guidance as eventually TICAP and ARCAP will provide key guidance for Part 53. This kind of goes back to what I was trying to explain and maybe I wasn't doing a very good job.

MEMBER BROWN: But it's not in the rule.

Is that in the rule, in the preamble or something like that? I missed it.

MR. HOELLMAN: It's in Enclosure 1B, is the availability of guidance discussion.

It just touches on TICAP and ARCAP for now but we do recognize that the content of applications is a key guidance document under the existing regulations and we expect it to continue to be an important guidance document for the develop and review of applications.

Where INC falls in under this chart here was --

MEMBER BROWN: 1B, are you talking about 1B right now?

MR. HOELLMAN: I'm talking about the slide. Where INC is referenced would be under the safety functions, design criteria, and SSE safety classification, and under the safety-related SSE criteria.

MEMBER BROWN: Which part of this block? Is it the upper left-hand?

MR. HOELLMAN: Green box, Items 5 and 6. Those are TICAP chapters that have been issued in NEI 2107 Revision 1 I believe. And like I said, we're in the process of working through the internal

concurrences for the TICAP draft guide and ARCAP ISGs.

And they should be issued for public comment in the next couple weeks here. Hopefully, we'll get a chance to brief ACRS on the contents of those documents before we issue them final next year.

But that's really where the roadmap maybe exists on how everything works.

And so TICAP is really the next phase of the licensing modernization project and so it assumes that the designer is implementing NEI 1804 and Reg Guide 1.233, and structures the safety analysis report a little differently to more align with that methodology.

MEMBER BROWN: But ARCAP and TICAP are not referenced at all in the rules, Framework A or B, it's only in the side documents.

MR. HOELLMAN: That's correct.

MEMBER BROWN: So, like I say, there's nothing aiding people that they have to meet some minimal design fundamentals for critical stuff, safety systems.

It's all up in the air, that's the way I read this. It's guidance and we can argue about it later as opposed to having them come in with a structured approach.

MR. HOELLMAN: There are requirements for safety-related and non-safety-related but safety-significant SSCs to be designed using generally accepted codes and standards, which maybe touches on some of the IEEE items you were mentioning, I don't know if we're still specifically talking about IEEE and INC equipment.

MEMBER BROWN: Right now for Part 50 and 52 the guidance is very clear relative to the fundamentals. They were written back in the analog days before digital stuff came up but those principles apply regardless.

I just hate to be parochial but it seems like I wasn't --

MR. BLEY: My memory is that those things are in the SRP and in some of the I&C ISGs.

MEMBER BROWN: Yes, but they're not part of the rule anymore.

MR. BLEY: They weren't part of the rule in the SRP and ISGs. They're not there currently.

MEMBER BROWN: No, IEEE-603 is in Part 50, 52 at 55AH, people's feet are held to the fire because it's in the rule and those principles are pretty much what we've talked about anytime we've reviewed either new systems for replacement or in the design

applications for new plans.

So, the only ones that have really been the one of issue is controlled access, which was largely physical access back in the 1990s. You didn't have to deal with electronic access from external sources.

So, we've fundamentally eliminated them from the rule now. ISG and the other ones are not part of the rule, neither are the SRPs.

MR. BLEY: Yes, I was saying they never have been --

(Simultaneous speaking.)

MEMBER BROWN: Dennis, the principles have been in IEEE 603-1991, they are dictated by 55AH. I've read it 400 times over the last 14 years. Obviously, my concern is going to be my concern.

I think I mentioned this a couple years ago about how those were going to be done and I missed whatever followed on from that.

MR. BLEY: I understand your line or reasoning but if an applicant comes in and doesn't use the guidance, the Staff always has to come. We think it's just going to be a check the box, the Staff can say that's not acceptable, right?

MEMBER BROWN: Those are not in the

guidance.

MR. BLEY: They will be in the guidance in TICAP and ARCAP and then in the advanced reactor design criteria that information is there.

The Applicant comes in and decides they want to use peanut butter and toothpaste, the NRC Staff can say no. I think we sometimes forget about the back part of the overall process, where they can say no, that doesn't meet the requirement.

(Simultaneous speaking.)

MR. BLEY: Any time an Applicant would not use the guidance they have a pretty tall mountain to climb to get through the scale for two.

CHAIR PETTI: I just had a process question, Jordan, we're going to get TICAP and ARCAP at the same time, correct?

MR. HOELLMAN: Yes, you mean both TICAP and ARCAP and Part 53, right?

CHAIR PETTI: I think we need to review those together, that's all.

MR. HOELLMAN: That would be better, that would make sense. And like I said, we're expecting to issue it for public comment in the near-term here. It walks or sort of discusses how to develop principal design criteria or use that reg guide as well.

So, maybe once you see it, Charlie, it will ease some of your concerns a little bit hopefully. Well, the Staff in many circumstances has noted that's not covered, therefore, we can't really say anything about that.

That happened 14, 13 years ago. We've come past that. So, the argument that the staff can say no anytime they want to, it really turns into a real log jam legally.

So, that's the foundation of having those principles in the rule itself, not the details but just the fundamentals, has been pretty instrumental in being able to ensure the systems that have come in the software-based, digital, computer-based world have pretty much complied with those and we've been able to accept them.

But without the rule I'm not so sure that would have worked out so well. I got the picture.

MR. HOELLMAN: I don't know if there's a whole lot of more to cover here. I'll just recap what's in that Enclosure 1B. So, we're engaged with the Department of Energy and Industry to develop this application of the content of application guidance for advanced reactors.

And like I said, it's been initially

developed as the Board applications under Parts 50 and 52.

The guidance documents TICAP and ARCAP will support developers in developing advanced reactor applications and facilitate the NRC Staff's review of applications for the variety of different application type, CP, OLs, COLs, manufacturing licenses, standard design approvals and design certifications.

The guidance documents provide an overview of information that should be included in an application, a review roadmap for NRC Staff with the principle purpose of ensuring consistency, quality, and uniformity of NRC Staff reviews and a well-defined base from which the NRC Staff can evaluate proposed changes to the scope and requirements of reviews.

While specific sections of the information are primarily aligned with the licensing and modernization project methodology, the concept and general information may be used to inform the review of applications to using other traditional licensing approaches and methodologies.

We think this is a first good shot at trying to take what industry has provided, endorse it, and practice it, learn from it, adjust it as necessary to support the final Part 53 rule.

Any other questions on guidance before we move to the last two slides? Dennis, do you have a question? It was a little fuzzy on my end at least.

MEMBER BROWN: Dennis, you're breaking up.

MR. BLEY: I'll be quiet.

CHAIR PETTI: Continue Jordan.

MR. HOELLMAN: I'm sorry. Dennis, if you get back on and are able to clear up the fuzziness, feel free to ask.

This is just the Section 7 of the FRN, a number of issues have been raised over the past two-plus years as we've been discussing that preliminary proposed rule language with ACRS and stakeholders.

ACRS has acknowledged that the extensive real-time interaction with stakeholders and ACRS presented the Staff with a very difficult challenge and commended the Staff's ability to graciously accept comments from all sources and to seek resolution of competing requests.

A number of these topics address specific areas that we've discussed throughout the meeting yesterday and today from the overall structure of the rule and the two frameworks to the use of the QHOs, the role ALARA plays within the rule, construction and manufacturing requirements, and topics surrounding

staffing generally, license reactor operator's training and simulation facilities.

Some of the questions were specifically developed to solicit additional feedback on areas where industry continues to have concerns. Other specific requests are related to specific Commission direction such as the financial qualifications.

To touch on something Greg mentioned yesterday, at the beginning of the rulemaking after the Commission issued the SRM and in our response to the SRM we did identify the 60-day public comment period associated with the rulemaking as a key uncertainty in meeting the Commission's directed schedule at the time of October 2024 for the final rule.

The staff continues to see the comment period as an uncertainty and they intentionally engaged in stakeholder engagement to mitigate the uncertainty.

Including these specific requests for comment now allows external stakeholders additional time to prepare comments and continue to engage the Staff in future periodic advanced reactor stakeholder meetings.

So, between this and the next slide is a

list of topics that we've specifically asked for comments on in the draft proposed rulemaking package.

Like I said, a number of them, we've already discussed over the past two days but these are the last two slides we have for our presentation today.

MR. BLEY: Is my voice clear now?

MR. HOELLMAN: Sounds good to me.

MR. BLEY: I wanted to sneak in and ask you a couple of us were discussing that it would be helpful, and maybe it's in the preamble and I haven't read past it, to try to explain how you decide what goes into guidance and what stays in the rule.

How comfortable are you with your consistency in those decisions you've made along the way?

MR. HOELLMAN: I don't think it's specifically called out in the preamble.

MR. BLEY: I didn't think so. If there was a way to do it it would be wonderful, but go ahead.

MR. HOELLMAN: I think generally what we've tried to do with the rule is to keep things technology-inclusive to the extent possible. Where items get to be design-specific, that's I think where

we've tried to draw the line and thought guidance is the best place to address it.

As we talked about, the PRA in a leading role methodology versus starting with PDC or GDC causes some difficulty at least with us trying to put that into guidance and make one framework that we thought would provide the clarity and predictability that we needed in the rule.

But that's a good question, I don't know. I'll let anyone else on the Staff side have an opportunity to respond if they want.

CHAIR PETTI: Jordan, just to amplify a little bit on Dennis's thoughts, that's one reason to look through. The other one is the what versus how prism, that hopefully Part 53 is mostly about the what and the how is left for guidance.

Now, some of the what is sometimes relegated to guidance for flexibility, that I understand. But it's making sure none of the how creeps into the requirements.

MR. HOELLMAN: Like I said, I don't know if I have the best answer for you but I'm happy to have someone else chime in if they want.

MR. RECKLEY: Jordan, this is Bill. Dave has a great point, we try to do that as much as

possible.

There are cases, and it's a mix in a package this big, that sometimes what we did is pull over something that if you want to say the how differentiates when you're in a prescriptive mode, we pulled over some of that.

But bigger picture, we tried to do what you're saying and I think we've talked in the past. To some degree we were forced to do it because the technology inclusive nature of this, in many cases we couldn't prescribe the how because it's going to differ for different technologies.

MEMBER HALNON: This is Greg. Just to give you a reference of one place that made us think about this comment, it's 53.4370 A1 VI. In that there are words like: in performing this assessment you'll do this, this, and this.

Item 2 talks about facility description and it says you should give special attention to certain attributes. There's another place under ALARA that says it seems like that should be or could be in guidance.

If you just want to get a context of what we were thinking of, that's where we're at and I don't think we have any specific recommendations, just more

of a curious how we're being consistent.

MEMBER BROWN: Bill, back on that other subject again -- Greg, are you finished? I'm sorry.

MEMBER HALNON: Yes, Charlie, I was just giving a reference of some context.

MEMBER BROWN: Bill, you were commenting on not the how to. The reference to 603 1991 and the principles, that is not a how-to, that is just a high-level set of fundamental design criteria but they don't tell you how to achieve independence, redundancy, defense in-depth.

It doesn't tell you how, it just says you've got to do those, you've got to look at them.

MR. RECKLEY: Right, not every standard is prescriptive and Jordan mentioned on the standards, and again this comes somewhat because of trying to address a wide variety of designs, some of which we don't even foresee right now probably, was that what we put in to the regulation was, as Jordan mentioned, under the design requirements they must use consensus codes and standards where they're available.

We didn't list them specifically because right now they don't exist in some cases. And so we put in the broad requirement to follow consensus codes and standards that's been approved by the NRC without

incorporating them by reference, like we have for ASME and IEEE in 5055A, as you mentioned.

We came part of the way to where you were but not necessarily being as specific in referencing a particular code like IEEE. So, that requirement is in there in both frameworks.

MEMBER BROWN: The point I'm trying to make is that particular standard, 603 1991, is not specific to any technology. It's totally technology-inclusive, you don't have to revise it to make it --

MR. RECKLEY: I understand.

MEMBER BROWN: And that's the beauty of that one. I know the ASME stuff, they are very specific in terms of a lot of things. Make a sample this being and put a notch in it that's so deep and blah-blah-blah, everything else.

That particular standard has really withstood the test of time for an overall design. It's what I did back in the Navy programs back when we had --

(Simultaneous speaking.)

MR. RECKLEY: And as a couple people have mentioned, we would expect people to continue to use that to the degree it's applicable to them. We just didn't list any codes and standards from any standards

development organization in Part 53.

We said use them but we didn't list any of them from ANS, IEEE, SAME, or even in the seismic area that we were talking about, the ASC 43, we're trying to make sure the rule can accommodate that but we don't list it within the regulations.

MEMBER BROWN: I got it, not that I agree.

MR. RECKLEY: I understand.

CHAIR PETTI: Just a comment, Members. This FRN-specific request for comments, I have picked a couple that I felt enough to comment on.

If you feel like something should be commented on in one of these items, I may have already commented on the draft but come prepared at full Committee if you want a couple sentences put in, if there are any of these where you feel you want to make a comment.

Because this is an area that is relatively new in terms of what we've seen today.

MEMBER BROWN: Are you talking about the enclosures, Dave, the two which had the content availability of documents?

CHAIR PETTI: No. NRC is requesting specific comments on these categories of the last two slides. And if there's one that you feel -- there's a

couple, in the draft letter I have I'm touching on a couple of these.

But come prepared if there is something that you feel strongly enough.

VB: Yes, I wanted to raise one of those comments now, Dave, at least briefly and then we can discuss in full Committee in more detail. I've been thinking a lot today about this issue of the self-mitigating or whatever designs.

And it seems like one potential pitfall with that is if that is the basis for going with, say, the general operator license instead of specific SRO licenses, then finding even a highly unlikely or minor departure from that where human action might be needed admitted totally derail the licensing basis for that facility.

And I'm thinking back when we learned as we went that we needed to think about beyond design basis accidents, we didn't go back and say, okay, all plants are now unlicensed because the design basis was not adequate, we had a mechanical to say, okay, yes, you have these in your design basis but now you still do have to think about these additional items that are beyond design basis.

And I'm wondering whether it's worth

reformulating that concept of self-mitigating to say that if you are able to persuade the NRC when you first come for licensing that, yes, you fall in that category and hence should very much lower expectations regarding operator qualifications or licensing, et cetera, if departures are identified that do require some operator action, if it's limited enough this could be accommodated by minor additional requirements without going to the full range of needing an SRO.

And again, I'm thinking about this from the point of view of incentives, you don't want the reactor owner-operator to have an incentive to hide the information because they don't want to end up with a requirement for SROs downstream because of it.

So, I'm wondering whether that category needs some additional caveats and in some sense it goes against regulatory certainly but we might be in a situation where there's good reason why we may not have regulatory certainty yet.

So, that's my comment and I can think about it more, obviously, in the next two weeks.

CHAIR PETTI: I'm sure we're going to talk about that coupled with AERI, we've talked about it more than once so thank you. Well, Members, unless there's more comments, we've been going at this now

for --

MR. HOELLMAN: Dave, this is Jordan Holman again. I just wanted to make sure all the Members are clear that these specific requests for comments, they're in Section 7 at the end of Enclosure 1A.

CHAIR PETTI: We've been going at this a while. I think you're done, Jordan?

MR. HOELLMAN: I'm done, yes. I wasn't sure from some of the Members' comments if they knew specifically where to find them so I wanted to be clear.

CHAIR PETTI: I'm thinking we need to take a break before we move on to the industry and public comment phase because I think we've finished everything, right, from the Staff?

MR. HOELLMAN: That's right, Dave.

CHAIR PETTI: Why don't we take a break until 45 minutes after the hour? We'll resume then, thank you.

(Whereupon, the above-entitled matter went off the record at 4:21 p.m. and resumed at 4:45 p.m.)

MS. LANE: Yes, can you guys hear me?

CHAIR PETTI: Yes.

MS. LANE: Okay, great. Thanks. So good afternoon, everybody. Again, my name is Hilary Lane.

I'm the Director of Fuel and Radiation Safety at the Nuclear Energy Institute, NEI. Thank you for the opportunity to provide a few comments today on the recently released draft proposal for Part 53.

First, we wanted to acknowledge that to reach this stage in the rulemaking process is a huge milestone for both NRC staff, management alike, and industry. And as can be seen from the volume of the draft package and the volume of industry comments, including the joint NEI USNIC letter that was sent on August 31st just a few weeks ago, an enormous level of effort has gone into the rulemaking from a wide range of stakeholders.

We appreciate the staff's presentations at the recent October 12th advance reactor stakeholder meeting which discussed changes to the overall package and the language. We're still evaluating these changes in detail, to include the changes to fire protection language in Framework B which the staff explains was made to better align with framework A, and the new Interim Staff Guidance, or ISG, on operator licensing.

We note that the NRC staff is also looking to reconcile changes in the Part 50.52 rulemaking with the Part 53 rulemaking once the Part 50.52 rulemaking

is issued as a final rule. We support that effort and recognize that that will take careful consideration to ensure that the proper changes are made.

We would like to correct the record on some of yesterday's discussion related to AERI. The staff acknowledged that while they have received feedback that the entry criteria is overly restrictive that they, in turn, have not received any feedback on alternatives.

NEI did, in fact, propose alternative criteria in our August 31st letter to the NRC, both in Attachment B, Bravo, and Attachment D, Delta. Attachment Delta was a full attachment dedicated to our comments on DG 1414. Our comments in Attachment Bravo outlined that it was not clear why the cutoff distance is 100 meters and the basis for that distance cannot be found.

Given the AERI approach is intended for facilities with maximum accidents of very low consequence, it would seem the consequences should be calculated using an actual distance of interest for the facility. Things like source terms and meteorology would be site specific.

We propose that the distance should be the boundary of the owner-controlled area which is what

power reactor sites use in their EP dose assessment consequence model if the distance of that boundary extends beyond 100 meters.

Further, the four-day term should be changed to be consistent with the SMR DP rule version of the same criterion, so four days should be changed to the 96 hours for consistency.

With the addition of the AERI process is a positive change in Framework B, the specifics of the entry criteria are extremely restrictive, as we discussed yesterday, and were characterized by the NRC as not being a safety criterion. They effectively become a very restrictive safety criterion for a designer that would seek to use the alternative evaluation.

We note that the staff is also soliciting public comment in Section 7 of the Draft FRN on a variety of topics that are important to the industry. We look forward to providing constructive comments on these questions, as well as reiterating our outstanding concerns we have with specific rule language.

However, we do note that the nature and the phrasing of some of these questions in Section 7 appears to reflect a lack of understanding of some of

industry's concerns on many of the key issues. As an example, Section 7 solicited feedback on the new facility safety program or FSP, currently in Framework A, asking whether the FSP concept could contribute to improving the NRC's overall regulatory programs and whether the FSP should be included in Framework B.

We find the nature of this question to be perplexing as it's incumbent upon the NRC, not industry or members of the public, to justify new programs. In fact, for about 18 months, the industry has made repeated requests to the NRC staff for a detailed explanation of the new FSP, how it would reduce regulatory burden, and examples of how the FSP would have been utilized in contrast to existing processes.

We believe the FSP increases regulatory burden without increasing safety. Industry has advocated for its removal from the rule language that NRC now entertains including the provision in Framework B. We find questions of this nature to be counterproductive and misleading.

The industry continues to believe that a technology-inclusive, risk-informed, performance-based Part 53 rule is vital to the long-term success of the advance reactor community and in meeting the intent of

NEIMA. Our joint comments from NEI and USNIC sent in on August 31st focus on industry's top six concerns which must be addressed in order to have a rule that we consider used and useful.

At a high level, those top six concerns are number one, there is no need for two frameworks. Number two, remove QHOs as performance criteria in the rule. Number three, remove ALARA as a design requirement. Number four, remove requirements to design to protect against and withstand beyond design basis events. Number five, remove the facility safety program or FSP. And finally, number six, reconcile new programs and terminology.

We note that the ACRS shares many of these same concerns as outlined in your August 2nd letter to NRR which contains eight recommendations to NRR staff. Notably, ACRS challenged the staff on whether Part 53 is considered to be streamlined and efficient and stated that the rule may be too cumbersome to implement and may not be used.

In short, we view the challenges in the current rule language centering around two main themes. Number one, reduction, predictability, and flexibility to the inclusion of prescriptive details in rule text that are typically found in guidance.

And number two, increase complexity and regulatory burdens without any commensurate increase in safety.

Over the course of the last 18 months, NEI and USNIC on behalf of our members have provided extensive written comments as the rule is being developed and we have made numerous presentations in public meetings and to this committee. Based on our early reading of the Part 53 draft proposal released on September 30th just a few weeks ago, we're disappointed that none of our six major concerns that were just listed have not been addressed or resolved.

Further, many of these issues we believe to be outstanding policy issues which if left unresolved will need to be addressed at the Commission level. This will only add time and complexity to the Commission's review when they receive the package in February.

In addition, today's slides have provided industry feedback, starting on Slide 166, did not fully capture the industry's feedback that was provided in our comprehensive August 31st letter from the NEI and USNIC. The slides do not fully capture the major concerns nor fully capture the feedback on Framework B specifically. So again, we encourage NRC to refer back to our August 31st letter which also

contains six detailed attachments of our comments with proposed recommendations.

Further, the NRC's decision not to address major stakeholder concerns until the formal proposed rulemaking phase creates a distraction from discussing more detailed aspects of the rule such as fire protection, security, and EP which also need more discussion and development.

So in closing, thank you for the opportunity to speak with you today and we look forward to future opportunities to engage and interact with the staff and this committee at the appropriate points during the rulemaking process and the staff addresses their formal comments they received. Thank you very much.

CHAIR PETTI: Thank you. And next we have -- is it NIA is going to present?

MR. WIDMAYER: No, the Breakthrough Institute.

CHAIR PETTI: Breakthrough, sorry. I got them mixed up. Breakthrough Institute, please.

MS. FRANOVICH: Thank you. This is Rani Franovich. Can you hear me?

CHAIR PETTI: Yes.

MS. FRANOVICH: Okay. I speak on behalf

of the Breakthrough Institute or BTI, which is an independent, global research center that identifies and promotes technological solutions to environmental and human development challenges. We believe new and advanced reactors represent critical pathways to decarbonization. BTI does not receive funding from industry.

Before joining BTI, I spent 30 years with the NRC staff, including eight years in Region II and 20 years in leadership roles in headquarters. I presented to the ACRS then and I appreciate this opportunity to comment as a member of the public.

The ACRS plays an important role in reforming regulatory mindsets and encouraging innovation to ensure Part 53 is responsive to congressional mandates and public interest.

I was a resident inspector in 1998 when much needed regulatory reforms were the subject of congressional hearings. Under threat of deep budget cuts, NRC commissioners promised to implement risk-informed and performance-based rules and programs and NRC survived the near-death experience.

In October 1998, the NRC staff conducted a four day public workshop or concluded that four day public workshop to agree in concept to a

transformational oversight regime proposed by industry. Under the new reactor oversight process, NRC replaced enforcement of regulatory compliance with a risk-informed, performance-based framework for assessing safety performance.

The Commission defined the terms risk informed and performance based in 1999 and called for performance-based regulations to afford applicants and licensees the flexibility to determine how they will achieve improved outcomes and to encourage and reward those improved outcomes.

An example might be flexible operator staffing requirements that incentivize innovation. Yes, operators are important, but humans are the weakest link in any system. Reduced reliance on human operator action is a positive innovation that should be rewarded. Performance based regulatory reforms since the late 1990s have not extended to licensing and Parts 50 and 52 remain largely prescriptive and deterministic.

In 2009, Southern Company embarked on the LMP to adapt technical requirements in Part 50 for non-light water reactors. As Jordan confirmed yesterday, yesterday morning, the initial Part 53, now Framework A, attempts to codify LMP, and is largely

built upon existing regulatory requirements developed decades ago to license large light water reactors.

The preliminary rule also attempts to codify operational programs, as Hilary mentioned, adding additional regulatory burden and operating costs for applicants and licensees with no apparent increase in safety.

In November 2021, the NRC extended the Part 53 review schedule or rulemaking development schedule by 9 months to reach quote reach alignment with external stakeholders on the scope of the rulemaking and further develop the language end quote. Congress supported the extension quote to resolve major concerns with the existing draft language end quote.

In February 2022, the NRC released a hefty 402 page consolidated preliminary rule. NEI and USNIC surveyed 22 developers and applicants and presented the results to NRC staff in May. Only 14 percent of respondents were likely to use Part 53. Ten percent indicated they would not use Part 53 for first of a kind designs. Thirty-eight percent did not see the benefit in using Part 53. Another 38 percent were not likely to use it. Many stakeholders objected to the requirement of a formal PRA as a costly burden without

a commensurate safety benefit.

In response, the NRC unveiled a new 304-page option, Framework B, that offered an alternative evaluation for risk insights for AERI. If, and I agree with Hilary here, a set of overly conservative deterministic and prescriptive criteria are met. Part 53 was developed by NRC staff and released for informal comment in a time-consuming, iterative process.

NRC staff were not responsive to many comments. Nor were they receptive based on legal counsel to numerous requests for workshops to improve their understanding of stakeholder concerns and provide a more open collaborative framework for stakeholder participation.

Former NRC Chairman and General Counsel Steve Burns saw no legal impediment to workshops and cosigned a letter with BTI reiterating the request to no avail. As such, the nine-month extension was squandered.

The NRC staff reports today that they have streamlined the rule package as much as possible, yet it weighs in at over 1200 pages. Generally, the volume of any regulation is commensurate with its level of prescriptiveness and the volume and

prescriptive nature of Part 53 undermine regulatory agility and the rules' durability over time.

Framework A's heavy reliance on a formal PRA makes it almost risk based as opposed to risk informed. Framework B also relies on a formal PRA unless again the applicant can meet the incredible assumptions in AERI. Neither framework affords developers or applicants sufficient flexibility to determine how to meet performance objectives in ways that encourage and reward improved outcomes. For all these reasons, the rule does not satisfy NEIMA, nor does it comply with prior Commission direction disapproving codification of safety goals applying QHOs.

The modeling uncertainties that Vesna raises also make QHOs inaccurate for projections of risk and observation of effects to confirm performance is not statistically possible. BTI and other stakeholders have no qualms with throwing the baby out with the bath water to achieve the unrealized, unrealized transformational potential of Part 53.

However, that may not be altogether necessary. The NRC staff could retain high level performance objectives in Subparts Bravo and Charlie, but Frameworks Alpha and Bravo should represent

acceptable pathways in guidance. This would allow greater flexibility for innovation, while affording regulatory predictability and agility.

Unlike rules, guidance can be developed, updated, and enhanced as needed over time and informed by operating experience and lessons learned. By contrast, changes to regulations involve a laborious multi-year process that severely constrains regulatory agility.

NRR's executive leadership has argued that the only way to provide predictability is through regulation. The argument is specious. By this logic, predictability is not assured by the Standard Review Plan routinely used now to develop and evaluate licensing submittals under Part 50.

Yesterday, and again today, ACRS members on numerous occasions requested assistance navigating the complex rule and guidance. Byzantine flow charts represent the exasperating licensing labyrinth. Last week, an NRC Commissioner observed that stakeholders continue to complain about the volume of Part 53 and cumbersome frameworks that are not usable or likely to be used.

NRR's executive leadership responded that it does not want to preclude the Commission from

weighing in on the expansive breadth of the rule. This is an abdication of leadership. Hard decisions remain about what is necessary and sufficient for the Part 53 rule.

Now the matter is before the ACRS. Yesterday and today, I observed much nervous energy among some ACRS members about how new corrosive coolant media may affect systems, structures, and components and what if we find operator action is needed under certain plant conditions?

I echo Greg Halnon's sentiments. Keep an open mind. And by the way, creating a rule that precludes unknowns from occurring is neither reasonable nor realistic. Not every potential condition adverse to quality or instance when operator action is desired can or should be prevented through prescriptive licensing regulations. Attempts to do so constrain innovation and disincentivize improve safety performance of evolutionary designs.

Moreover, such attempts are unnecessary at this juncture. Not all unknowns must be resolved at licensing. NRC has many tools in its tool kit to address emergent operating experience and take appropriate regulatory action including issuing generic communications, conducting reactive and

supplemental inspections, increasing regulatory oversight under Inspection Manual Chapter 0350, taking enforcement actions including escalated enforcements, issuing orders including shutdown orders, and imposing new regulatory requirements under backfit provisions.

Discomfort around unknowns is a fact of life. However, this discomfort must be tempered with legislative context and situational awareness. Legislative context is not limited to NEIMA. Fifty years ago, the Energy Reorganization Act acknowledged the benefits of nuclear energy to quote meet the needs of present and future generations, to increase the productivity of the national economy, and strengthen its position in regard to international trade, to make the nation self-sufficient in energy, to advance the goals of restoring, protecting, and enhancing environmental quality, and to assure public health and safety end quote.

The NRC's role is to enable, enable the safe, civilian use of nuclear energy, not to constrain or obstruct deployment with onerous, prescriptive requirements from antiquated regulatory regimes. Situational awareness is the public's interest. Situation awareness of the public's interest is vital. Environmentalists, scientists, scholars, activists,

thought leaders, and policymakers from both political parties are increasingly supportive of civilian nuclear power. The Russian invasion of Ukraine has accelerated urgent, urgent calls for safe, reliable, and clean nuclear energy.

Now again, BTI received no funding from the nuclear industry. We represent the public's interests. Nuclear power advances the nation's clean energy goals, enhances environmental quality, and supplies reliable electricity to the transmission grid. Rapid deployment of new and advanced reactors is an urgent public interest.

In closing, the ACRS plays an important role in ensuring the NRC staff delivers a quality product to the Commission that is responsive to NEIMA. A better rule is more important than a quicker one.

BTI strongly encourages the ACRS to craft a letter to the Commission identifying the key issues and recommending the Commission exercise its discretion to redirect the staff to expeditiously work with external stakeholders in a more open, collaborative manner, come to agreement on unresolved issues like what should be governed by regulation versus guidance, and take measures to ensure the rule is significantly streamlined, more performance based,

and appropriately risk informed with minimum need for exemptions.

Timely agreement on these matters can be reached if the NRC staff is open and receptive to significant revision. A corresponding change in regulatory posture and customer service ethic also are necessary to satisfy NEIMA.

I would like to briefly respond to an astute and timely reminder from ACR Member Petti. Guidance does not establish requirements. Guidance provides a roadmap of one or more acceptable approach. An applicant can choose a licensing approach not defined in guidance and should not be discouraged from doing so just because it presents a daunting mountain to climb. The staff's ultimate safety determination must be based on regulatory requirements and engineering judgments, not failure to follow established guidance. This regulatory discipline without a standard checklist must be reinforced by NRC leadership, the ACRS, and the Commission going forward.

It is practical for NRC to preserve new, approved approaches that satisfy regulatory requirements and guidance for broad reference. A successful, high level Part 53 rule could eventually

feature a multitude of technology-specific Standard Review Plans. Again, guidance is much easier to develop and update than regulations affording greater regulatory agility.

I thank you, Member Petti, and the rest of the ACRS Subcommittee for your audience.

CHAIR PETTI: Thank you. Now if there's any other public comments, please unmute yourself, identify yourself, and give us your comment.

Yes, Derrick?

MR. WIDMAYER: There's at least three, I think that want to speak and some folks have their hands up. I don't know if you want to call on them.

CHAIR PETTI: Yes, I see that. Okay, yes. Let's start with Kalene Walker.

MS. WALKER: Hi. I'll try and keep it a little briefer than the previous speaker.

I'm wondering when the NRC will be addressing Part 72 for these new reactor concepts? There's so many different kinds of fuel: there's molten salt, there's TRISO pellets, there's fluoride salt. All these new fuels. When is that going to be a required assessment as part of -- will that be a required assessment before you allow these things to move forward?

I live in a reactor community where we have a -- the spent fuel waste is stranded because of all those reasons that I'm sure you're aware of. So is it possible to answer that question? Part 72.

CHAIR PETTI: At this point we don't respond to input from the public. Thank you.

MS. WALKER: So you can't mention -- you can't say whether or not you're going to address Part 72?

CHAIR PETTI: We can't. You can always write directly to the Designated Federal Official, send an email, and they can respond to that.

MS. WALKER: No, I mean within this new rule. I mean isn't the waste -- NRC is responsible from cradle to grave, so when is the waste aspect going to be addressed? That's not an easy answer? I thought it would be.

MEMBER REMPE: So this is Joy Rempe and I'm Chairman of the ACRS and as Member Petti indicated this is a time for public comments and your question is definitely a question that can be sent to the Designated Federal Official, Derek Widmayer, and he can forward it to the staff and they can respond to you. Okay?

MS. WALKER: Okay. Can I make a quick

comment then?

MEMBER REMPE: Certainly.

MS. WALKER: The first, over an hour of today was spent on self-reliant mitigation facilities and discussion about operators and all of that which you all recall.

And so what I kept wanting to hear was would the licensee be responsible for showing how they can respond to one of these unknowns? How is there a mitigation strategy when something happens, you know? So that just keeps my ear curved because being in a reactor community with spent fuel storage, I've studied it quite a bit and I wanted to let you know what your fellow colleagues are doing in Part 72 with the Division of Spent Fuel.

The canisters are known to corrode and crack eventually and yet, and so the mitigation strategy presented by the industry is to repair technology or to put it into over-packed casks. Neither of those have been approved or evaluated by the NRC.

And when I asked the NRC how can they say they can do this when it hasn't been approved? And they said in the unlikely event that this event happens, the licensee will present with us a

mitigation strategy and the NRC will evaluate it. This would be way too late and I pity the poor emergency responders of the local community who have to respond to the mess from an irresponsible system. The NRC should require mitigation strategies, certainly for these spent fuel storage canisters. Thank you. Good luck on all of this.

CHAIR PETTI: Robert Fortner and then we'll do USNIC.

MR. FORTNER: Great. Thank you. My name is Robert Fortner. I'm a journalist. I don't know if this is going to be a comment or a question. I've heard BTI and others request repeatedly these workshops with NRC to hash through some of these issues, presumably the six that were mentioned in NEI's comment in today's session.

So I don't know if this is a comment or question but it certainly seems like a matter of public interest what NRC's stance is on that meeting request and I would also be interested to know what ACRS thinks of that request.

Yes, so if you answer it, I guess it's a question.

I would just comment that it seems like a very important issue. Thank you.

MEMBER REMPE: So this Joy. If I can just briefly reiterate about this is the time for comments, but I also wanted to expand that we do consider these question-type comments as we assimilate our thoughts and ideas in our letter report. So thank you.

CHAIR PETTI: USNIC.

MR. DRAFFIN: Hello. I'm Cyril Draffin, Senior Fellow for Advanced Nuclear with the US Nuclear Industry Council. And at the beginning of today's meeting, Ron commented that the NRC staff has been very responsive to ACRS comments.

Just to clarify from the industry perspective under the NRC established informal process in advance of the rulemaking package, there's no specific provision for responding to stakeholder comments. And while the NRC staff has addressed some of the industry's input, a substantial portion of our comments have not been addressed to date.

As you heard from the industry and NGO speakers today, as well as in prior meetings where we presented and the detail of industry submissions in November of last year and the last couple months, there's substantial uncertainty and concerns with Part 53 among many developers and whether Part 53 will indeed be useful or used. So I just wanted to put

that on the record as you wrap up your deliberations for today.

CHAIR PETTI: Thank you. Any other comments?

Okay, not hearing any, I want to thank the staff. It's been a really full two days covering a tremendous amount of information. We appreciate the perspectives from industry and members of the public and I will call this meeting to a close and we'll see people -- one more.

Is that another member of the public, Connie Kline? Maybe not.

MS. KLINE: Can you hear me?

CHAIR PETTI: Yes. Yes.

MS. KLINE: Just very quickly, I was unable to attend yesterday's session. I attended most of today's session. To me, it seems contrary to the industry's comments, it seems to me many concessions have already been either considered or made to the industry. And I strongly disagree with the idea that unknowns don't have to be addressed before licensing. Every effort should be made to address as many unknowns as possible.

And I'm just going to close with a trite adage. Better safe than sorry.

CHAIR PETTI: Thank you. Okay, and with that, I adjourn the meeting and we'll see everybody at full committee in a couple of weeks. Thank you. Have a good evening.

(Whereupon, the above-entitled matter went off the record at 5:21 p.m.)

Advisory Committee on Reactor Safeguards (ACRS) Regulatory Rulemaking, Policies and Practices: Part 53 Subcommittee

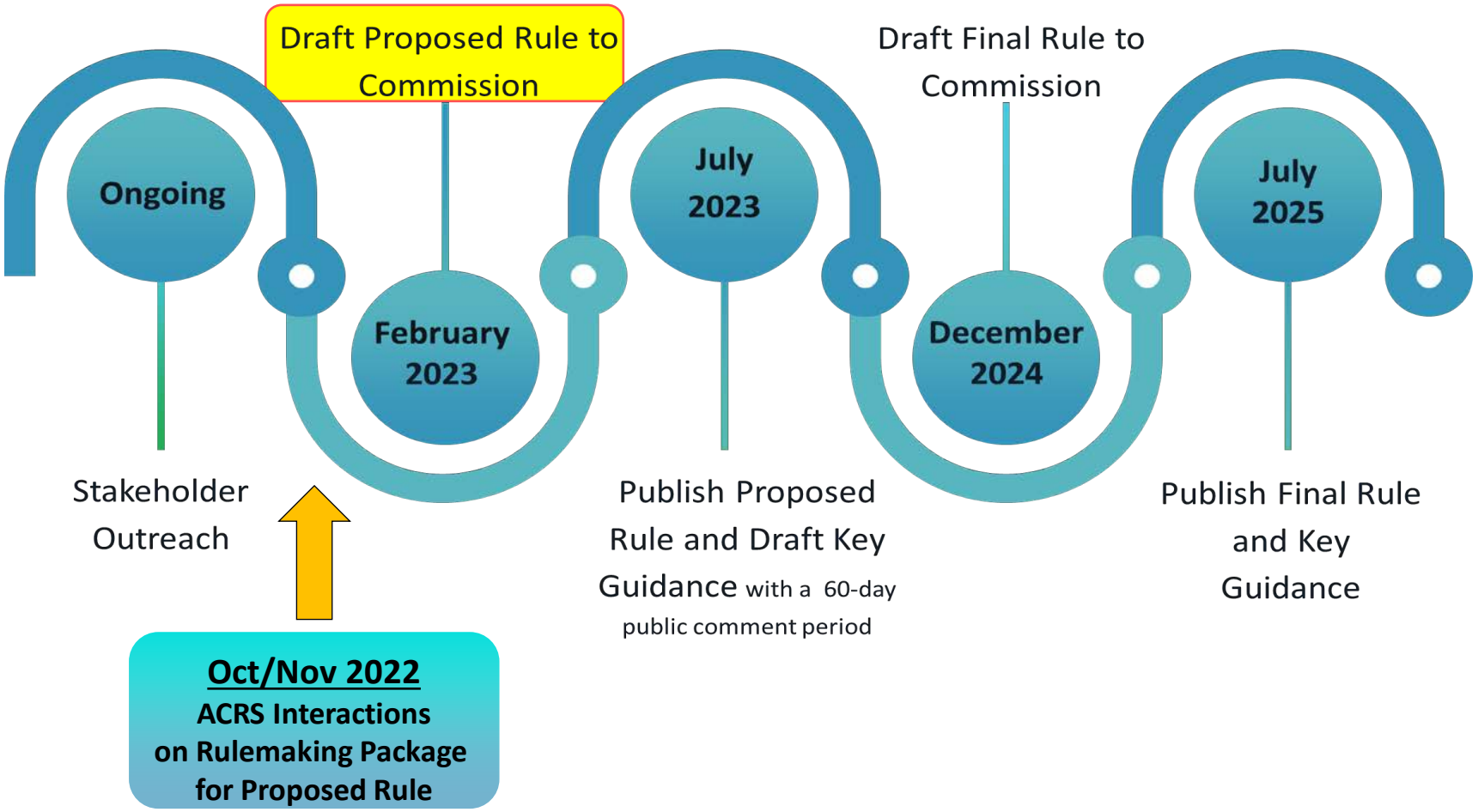
10 CFR Part 53 "Licensing and Regulation of Advanced Nuclear Reactors"

October 18-19, 2022

Agenda – October 18th

8:35 am – 10:00 am	Staff Introduction and Overview of Frameworks A and B
10:00 am – 11:45 am	Draft Proposed Language for Quantitative Health Objectives (QHOs)/Safety Analysis
11:45 am – 12:45pm	Lunch
12:45 pm – 5:00 pm	Draft Proposed Language for Alternative Evaluation for Risk Insights (AERI) Methodology and Guidance Documents

Rulemaking Schedule



Part 53 Licensing Frameworks

Subpart A - General Provisions

Subpart B - Safety Requirements
Subpart C - Design Requirements
Subpart D - Siting
Subpart E - Construction/Manufacturing
Subpart F - Operations
Subpart G - Decommissioning
Subpart H – Application Requirements
Subpart I - License Maintenance
Subpart J - Reporting
Subpart K - Quality Assurance

Framework A

- Probabilistic Risk Assessment (PRA)-led approach
- Functional design criteria

Subpart N - Siting
Subpart O - Construction/Manufacturing
Subpart P - Operations
Subpart Q - Decommissioning
Subpart R - Application Requirements
Subpart S - License Maintenance
Subpart T - Reporting
Subpart U - Quality Assurance

Framework B

- Traditional use of risk insights
- Principal design criteria
- Includes an AERI approach

Rule Package (ML22272A034)

Federal Register Notice (FRN)		
Enclosure 1A	Preamble	ML22272A036
Enclosure 1B	Section by Section, Availability of Guidance	ML22272A038
Enclosure 1C	Framework A	ML22272A039
Enclosure 1D	Framework B	ML22272A040
Guidance Documents		
DG-1413	Licensing Events	ML22272A042
DG-1414	AERI Methodology	ML22272A045
DRO-ISG-2023-01	Operator Licensing Program Review ISG	ML22272A047
DRO-ISG-2023-02	Staffing Plan Review ISG Augmenting NUREG-1791	ML22272A049
DRO-ISG-2023-03	Scalable Human Factors Engineering Review ISG	ML22272A051

Sections 53.000 and 53.010

- Purpose
  - Provide optional frameworks for the issuance, amendment, renewal, and termination of licenses, permits, certifications, and approvals for commercial nuclear plants
- Frameworks
  - Framework A and Framework B are distinct
  - Applicants and licensees subject to the rules in this part must only use the subparts applicable to one framework

Subpart A – General Provisions (Definitions)

- Common Definitions
  - Commercial Nuclear Plant
  - Manufactured reactor
  - Manufactured reactor module
  - ***Safety function***
- Framework A Definitions
  - Construction, Licensing basis events (LBEs)
- Framework B Definitions
  - Construction, Design basis, Functional containment, Safety-related structures, systems, and components (SSCs), Severe nuclear accident

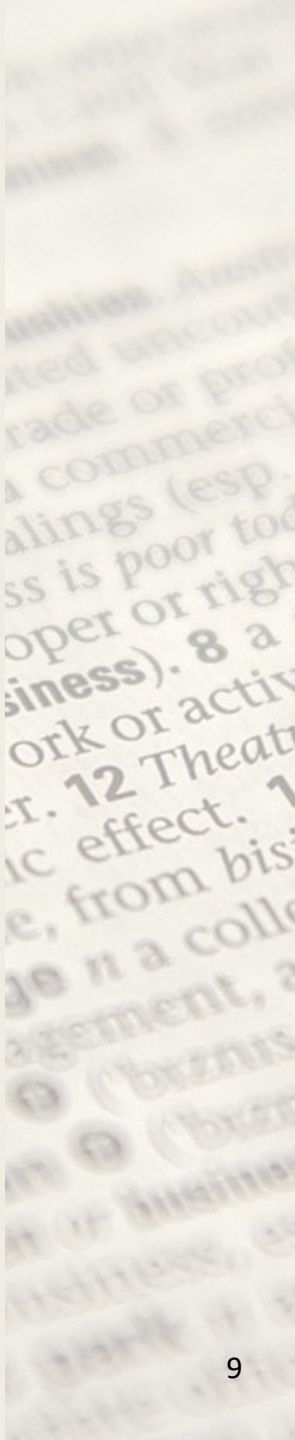
Subpart A – Safety Function Definition

- ***Safety function*** means a purpose served by a design feature, human action, or programmatic control to prevent or mitigate unplanned events and thereby demonstrate compliance with requirements in part 53 for limiting risks to public health and safety. Safety functions can be performed by any combination of the elements listed above and can be specified at the plant level or at the level of a particular barrier or system. The approach to identifying and addressing safety functions in Frameworks A and B are as follows:

(1) Within Framework A, the primary safety function is stated to be limiting the release of radioactive materials. Additional safety functions supporting the retention of radioactive materials, such as controlling reactivity, heat generation, heat removal, and chemical interactions, are determined for each reactor design by analyzing a spectrum of unplanned events.

(2) Within Framework B, multiple plant-level safety functions are assumed to apply to all reactor designs based on established requirements and historical practices. These fundamental safety functions include the control of reactivity, removal of heat, and limiting the release of radioactive materials. The protection of a specific barrier or system that contributes to meeting plant-level safety criteria may also be referred to as a safety function.

Framework A



Subpart B – Technology-Inclusive Safety Requirements

- 53.200 Safety objectives.
- 53.210 Safety criteria for design basis accidents.
- 53.220 Safety criteria for licensing basis events other than design basis accidents. ***(including QHOs)***
- 53.230 Safety functions.
- 53.240 Licensing basis events.
- 53.250 Defense-in-depth.
- 53.260 Normal operations.
- 53.270 Protection of plant workers.

Subpart C – Design and Analysis Requirements

§ 53.400	Design features for licensing basis events.
§ 53.410	Functional design criteria for design basis accidents.
§ 53.415	Protection against external hazards.
§ 53.420	Functional design criteria for licensing basis events other than design basis accidents.
§ 53.425	Design features and functional design criteria for normal operations.
§ 53.430	Design features and functional design criteria for protection of plant workers.
§ 53.440	Design requirements.
§ 53.450	Analysis requirements.
§ 53.460	***Safety categorization and special treatment.***
§ 53.470	Maintaining analytical safety margins used to justify operational flexibilities.
§ 53.480	Earthquake engineering.

Subpart D – Siting Requirements

§ 53.500	General siting.
§ 53.510	External hazards.
§ 53.520	Site characteristics.
§ 53.530	Population-related considerations
§ 53.540	Siting interfaces.

Subparts E & O Construction and Manufacturing Requirements

- Scope and purpose.
- Reporting of defects and noncompliance.
- Construction
- ***Manufacturing***
  - ***Fuel loading for manufactured reactor modules***

Subparts E & O

Fuel loading for manufactured reactor modules

§ 53.620(d)/53.4120(d) Fuel loading

- A manufacturing license may include authorizing the loading of fuel into a manufactured reactor module
- Specify required protections to prevent criticality
  - At least two independent mechanisms that can prevent criticality should conditions result in the maximum reactivity being attained for the fissile material
- Commission finding that a manufactured reactor module in required configuration is not a utilization facility as defined in the Atomic Energy Act
- Manufactured reactor module becomes a utilization facility in its final place of use after the Commission makes required findings on inspections, tests, analyses and acceptance criteria

Subpart F – Requirements for Operation

§ 53.700	Operational objectives.
§ 53.710	Maintaining capabilities and availability of structures, systems, and components.
§ 53.715	Maintenance, repair, and inspection programs.
§ 53.720	Response to seismic events.
§ 53.725	***General staffing, training, personnel qualifications, and human factors requirements.***
§ 53.845	<u>Programs</u> Radiation Protection Emergency preparedness Security Quality Assurance (QA) Integrity Assessment Fire protection Inservice inspection (ISI) and inservice testing (IST) Facility safety

Subpart G & Q Decommissioning Requirements

- Scope and purpose.
- Financial assurance for decommissioning.
- Cost estimates for decommissioning .
- Annual adjustments to cost estimates for decommissioning.
- Methods for providing financial assurance for decommissioning.
- Limitations on the use of decommissioning trust funds.
- NRC oversight.
- Reporting and recordkeeping requirements.
- Termination of license.
- Program requirements during decommissioning
- Release of part of a commercial nuclear plant or site for unrestricted use.

Subpart H – Licenses, Certifications, and Approvals

- § 53.1100 - 53.1121 General/common requirements.
- § 53.1124 Relationship between sections.
- § 53.1130 Limited work authorizations.
- § 53.1140 **Early site permits.**
- § 53.1200 Standard design approvals.
- § 53.1230 **Standard design certifications.**
- § 53.1270 Manufacturing licenses
- § 53.1300 Construction permits.
- § 53.1360 Operating licenses.
- § 53.1410 Combined licenses.
- § 53.1470 Standardization of commercial nuclear power plant designs: licenses to construct and operate nuclear power reactors of identical design at multiple sites.

Subparts I & S Maintaining and Revising Licensing Basis Information

- Licensing basis information.
- Specific terms and conditions of licenses
- Changes to licensing basis information requiring prior NRC approval.
- License amendments.
- Specific provisions (e.g., changes to standard designs)
- Other licensing basis information
- Evaluating changes to facility as described in final safety analysis reports (SAR).
- Program-related documents
- Transfer of licenses or permits.
- Termination of license.
- Information requests.
- Revocation, suspension, modification of licenses, permits, and approvals for cause.
- Backfitting.
- Renewal.

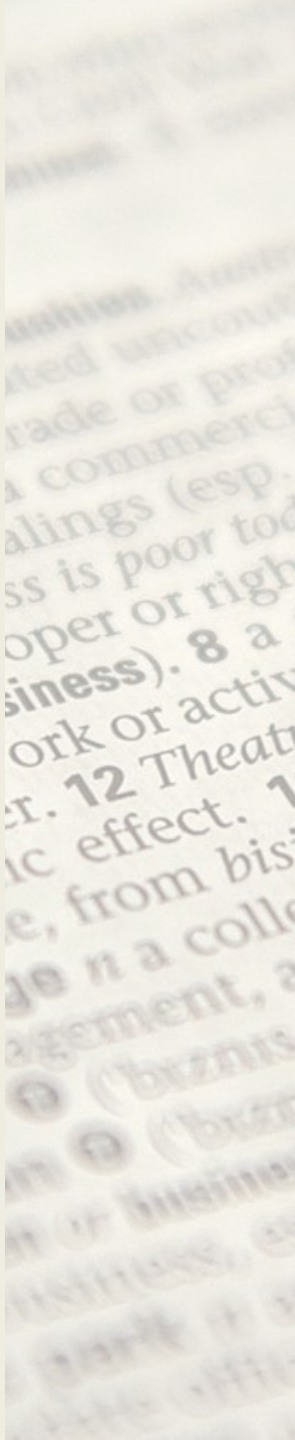
Subparts J & T Reporting and Other Administrative Requirements

- General information.
- Unfettered access for inspections.
- Maintenance of records, making of reports.
- Immediate notification requirements for operating commercial nuclear plants.
- Licensee event report system.
- Facility information and verification.
- Reporting of defects and noncompliance.
- Financial requirements.
- Financial qualifications.
- Annual financial reports.
- Licensee’s change of status; financial qualifications.
- Creditor regulations.
- Financial protection.
- Insurance required to stabilize and decontaminate plant following an accident.
- Financial protection requirements.

Subparts K & U Quality Assurance Criteria for Commercial Nuclear Plants

	10 CFR Part 50, Appendix B Criteria
• General Provisions	
• Organization	*I*
• Quality Assurance Program	*II*
• Design Control	*III*
• Procurement Document Control	*IV*
• Instructions, Procedures and Drawings	*V*
• Document Control	*VI*
• Control of Purchased Material, Equipment and Services	*VII*
• Identification and Control of Materials, Parts and Compo	*VIII*
• Control of Special Processes	*IX*
• Inspection	*X*
• Test Control	*XI*
• Control of Measuring and Test Equipment	*XII*
• Handling, Storage and Shipping	*XIII*
• Inspection, Test and Operating Status	*XIV*
• Nonconforming Materials, Parts or Components	*XV*
• Corrective Action	*XVI*
• Quality Assurance Records	*XVII*
• Audits	*XVIII*

Framework B



Subpart N - Siting

New subpart that facilitates risk-informed, performance-based approaches to siting and seismic design

§ 53.3505 Scope.

§ 53.3510 Definitions.

§ 53.3515 Factors to be considered when evaluating sites.

§ 53.3520 Non-seismic siting criteria.

§ ***53.3525 Geologic and seismic siting criteria.***

Subpart P – Requirements for Operation

§ 53.4200 Operational objectives.

§ 53.4210 Maintaining capabilities and availability of structures, systems, and components.

§ 53.4213 Technical specifications.

§ 53.4215 Response to seismic events.

§ 53.4220 ***General staffing, training, personnel qualifications, and human factors requirements.***

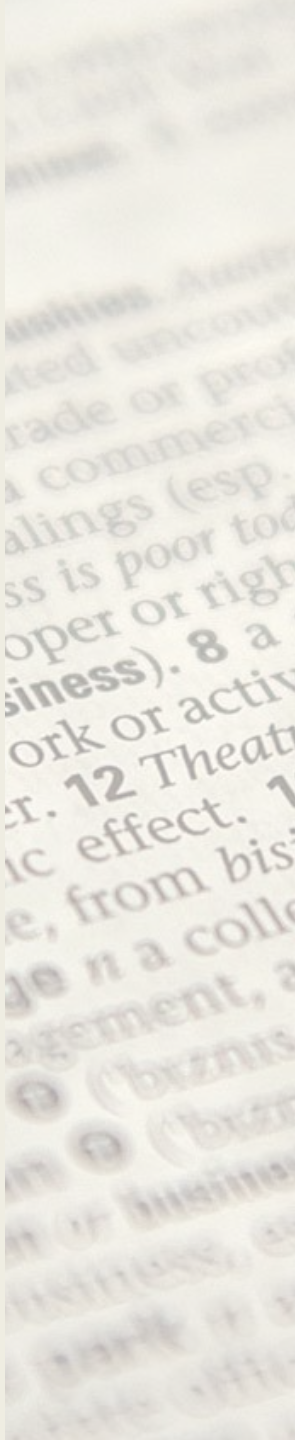
§ 53.4300 Programs
Radiation Protection
Emergency Preparedness
Security
QA
Integrity Assessment
Fire Protection
ISI and IST
Environmental qualification of electric equipment
Procedures and guidelines
Primary containment leakage testing

§ 53.4420 ***Mitigation of beyond-design-basis events.***

Subpart R – Licenses, Certifications, and Approvals

- § 53.4700 - 53.4721 General/common requirements.
- § 53.4724 Relationship between sections.
- § ***53.4730 General technical requirements.***
- § 53.4731 Risk-informed classification of SSCs.
- § ***53.4733 Seismic design alternatives.***
- § 53.4740 Limited work authorizations.
- § 53.4750 Early site permits.
- § 53.4800 Standard design approvals.
- § 53.4830 Standard design certifications.
- § 53.4870 Manufacturing licenses
- § 53.4900 Construction permits.
- § 53.4960 Operating licenses.
- § 53.5010 Combined licenses.
- § 53.5070 Standardization of commercial nuclear power plant designs: licenses to construct and operate nuclear power reactors of identical design at multiple sites.

Draft Proposed Language for QHOs / Safety Analysis



Framework A Integrated Approach to Ensure Comparable Findings

Existing Paradigm

- Does not specifically define “adequate protection” but compliance with NRC regulations and guidance may be presumed to assure adequate protection at a minimum
- Additional requirements as necessary or desirable to protect health or to minimize danger to life or property

Part 53 (SECY-20-0032)

1) Continue to provide reasonable assurance of adequate protection of public health and safety and the common defense and security,
2) Promote regulatory stability, predictability, and clarity,
3) Reduce requests for exemptions from the current requirements in 10 CFR Part 50 and 10 CFR Part 52,
4) Establish new requirements to address non-light-water reactor (LWR) technologies,
5) Recognize technological advancements in reactor design, and
6) Credit the response of advanced nuclear reactors to postulated accidents, including slower transient response times and relatively small and slow release of fission products.

Framework A Integrated Approach to Ensure Comparable Findings

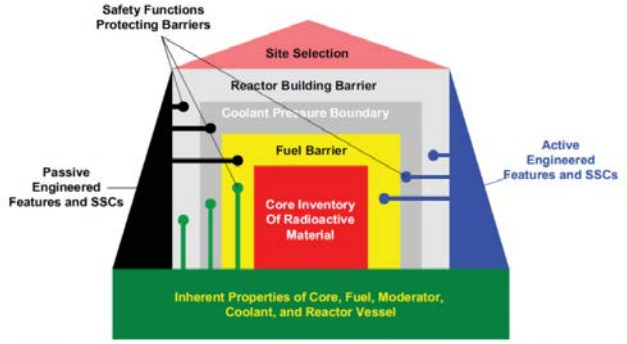
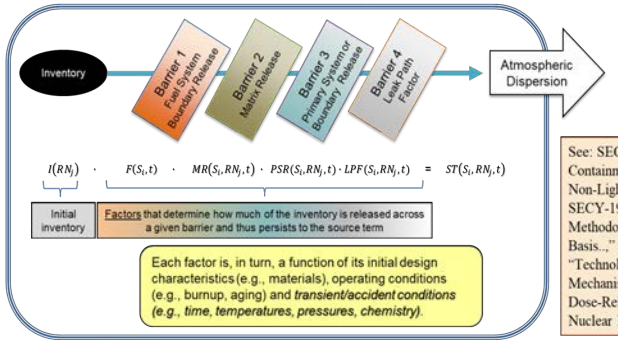


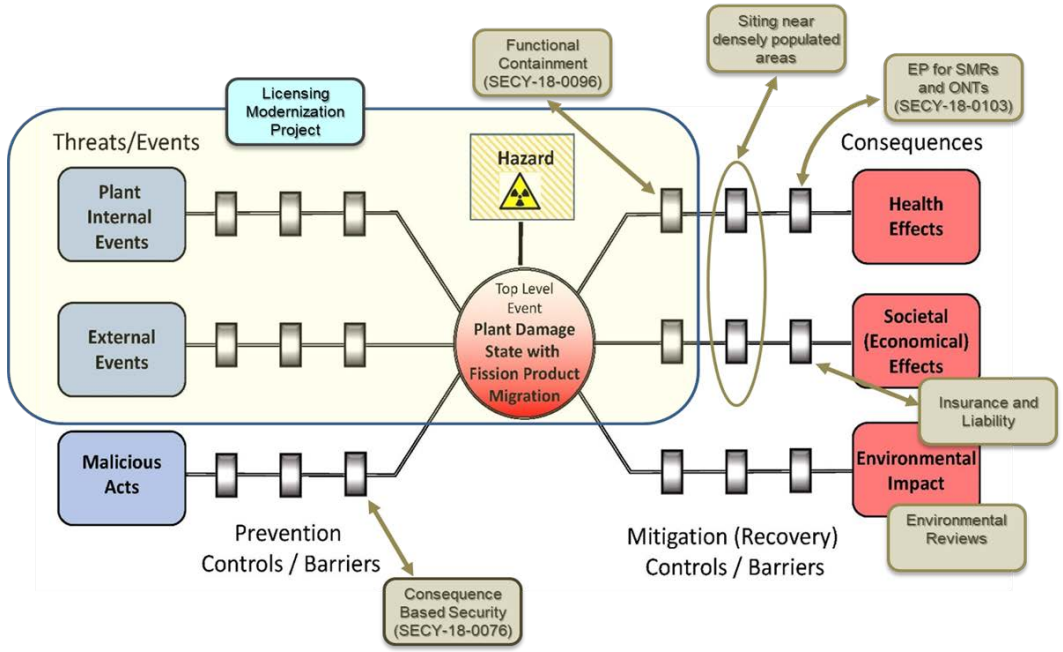
Figure 3-6. Elements of safety design approach incorporated into ***Plant Capability Defense-in-Depth***.

See INL/EXT-09-17139, "Next Generation Nuclear Plant Defense-in-Depth Approach"

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



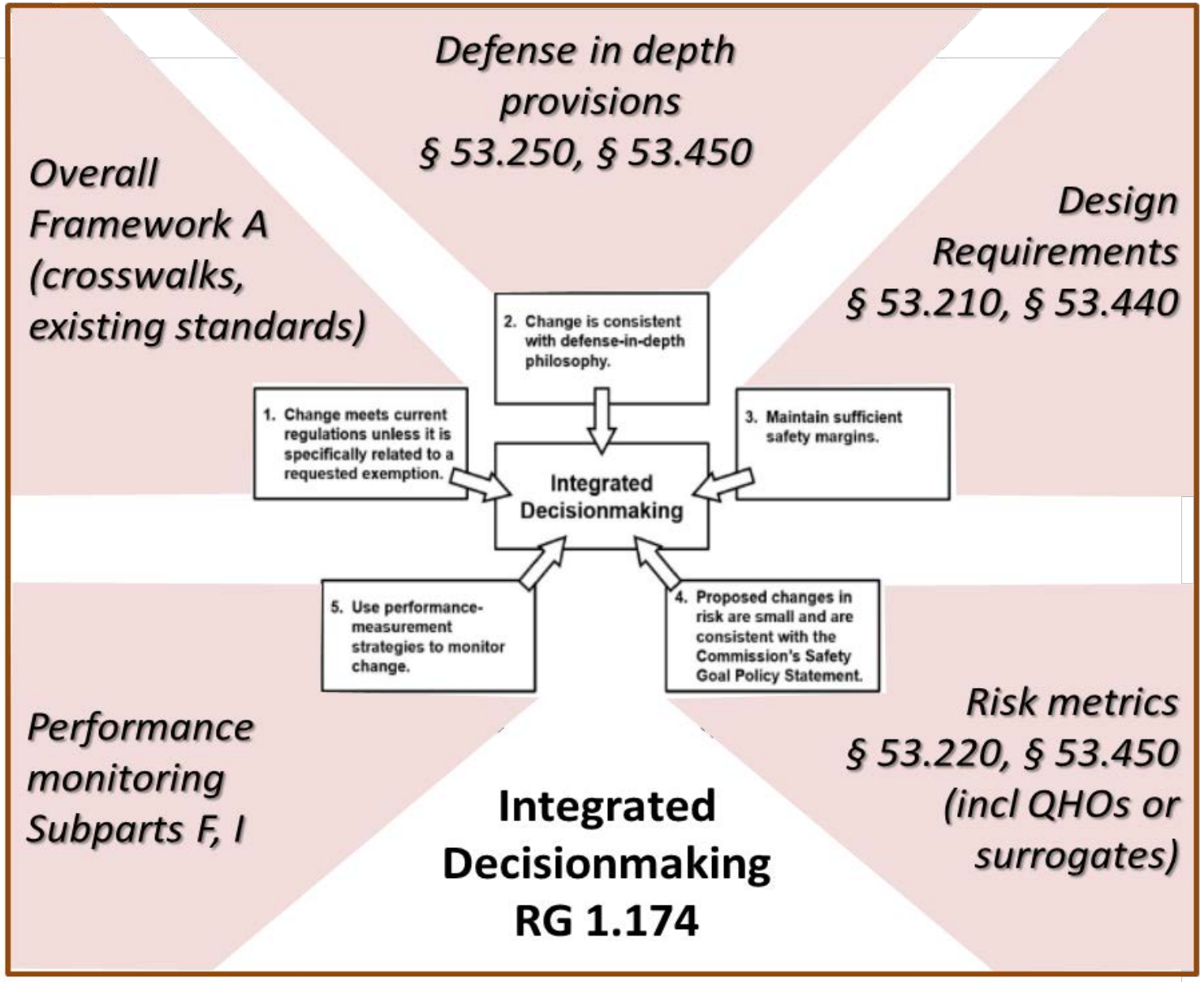
See: SECY-18-0096, "Functional Containment Performance Criteria for Non-Light-Water-Reactors," SECY-19-0117, "Technology-Inclusive .. Methodology to Inform the Licensing Basis.." and INL/EXT-20-58717, "Technology-Inclusive Determination of Mechanistic Source Terms for Offsite Dose-Related Assessments for Advanced Nuclear Reactor Facilities"



Framework A

Ensuring Comparable Level of Safety

Additional discussion in Preamble on how an integrated assessment like that in Regulatory Guide (RG) 1.174 can be used
to support the comparisons to existing requirements and related regulatory findings.



Framework A

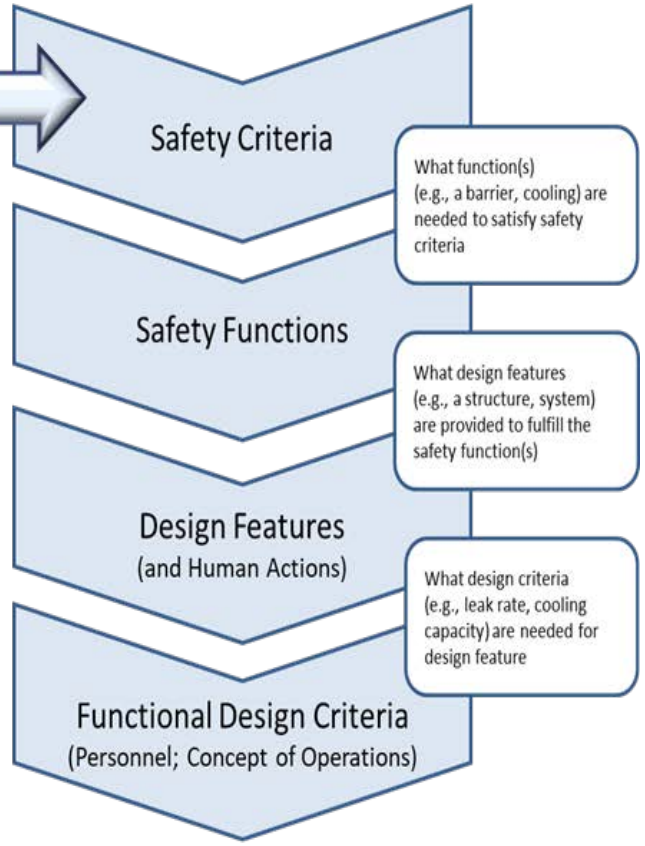
QHOs as one of several performance standards for LBEs

Safety Objectives & Criteria

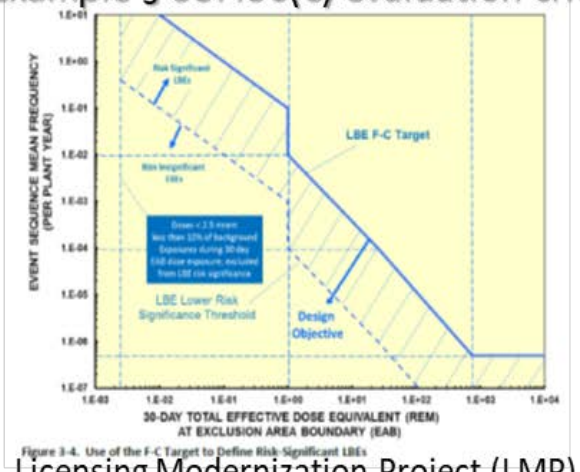
No immediate threat & consider potential risks

§ 53.210 Safety criteria for DBAs
§ 53.220 Safety criteria for other LBEs
- Address LBEs and provide defense in depth
- Cumulative risks (QHOs)

§ 53.450(e) Evaluation criteria for each LBE or event category



Example § 53.450(e) evaluation criteria



Licensing Modernization Project (LMP)

Additional discussion in Preamble on how QHOs are considered as one of several performance measures within Framework A. **Including the QHOs as one of several performance measures does not equate to the QHOs defining adequate protection of public health and safety.**

Framework A

Consideration of Feedback on Including QHOs

Comments generally fall into following groups:

- Rule should not include a cumulative risk measure
- Rule should include alternative risk measures
  - Surrogates for the QHOs
- Develop new safety goals

- It is appropriate to include a risk-related performance standard in Framework A as part of an integrated decisionmaking process, especially given the importance of risk assessments and consideration of risk-insights within the licensing process
- In SRM-SECY-10-0121, the Commission reaffirmed that "existing safety goals, safety performance expectations, subsidiary risk goals and associated risk guidance … are sufficient for new plants…"
- Surrogate measures tend to be technology- or design-specific. However, the Preamble reinforces that technology- or design-specific surrogates for the QHOs may be developed and proposed for use in supporting licensing under Framework A
- Major efforts such as developing new safety goals not included in rulemaking plan and not feasible considering project constraints

Subpart R – Licenses, Certifications, and Approvals

§ **53.4730(a)(1) Site safety analysis.**

- Proposed rule language derived from current requirements in § 52.79(a)(1); (i) through (v) are essentially identical to Part 52 requirements
- Requirements in subparagraph (vi) modified to ensure rule is technology-inclusive
- *Fuel or core damage or potential for large radiological releases from sources other than the reactor system* replaces *fission product release from the core into the containment*
- Fission product release analyses can be performed using a mechanistic source term or bounding assessment
- Applicant may elect to comply with more restrictive dose consequence criteria (e.g., 1 rem [roentgen equivalent man] TEDE [total effective dose equivalent] over 96 hours)

Subpart R – Licenses, Certifications, and Approvals

§ **53.4730(a)(5) Initiating events and accident analysis.**

- Objectives
  - Provide an equivalent level of safety by developing technology-inclusive analogs to applicable Part 50 and 52 requirements for initiating events and accident analyses
  - Provide an approach that better aligned with international regulatory paradigms, as appropriate and consistent with Commission policy
- Leveraged previously developed language from the “Part 5X” effort
- Preliminary proposed rule language maintains top-level acceptance criteria from Part 50 and 52

Subpart R – Licenses, Certifications, and Approvals

§ **53.4730(a)(5) Initiating events and accident analysis.**

(i) Analysis and Evaluation

- From § 52.79(a) with modifications to support technology-inclusiveness and Framework B event classifications.
- Recent changes to acknowledge multi-unit facilities (e.g., SMRs)

(ii) Design Basis Accidents

- Technology-inclusive requirements for DBA analyses and SSC classification drawing from §§ 50.34(a)(4) and 50.46.
- Includes deterministic classification approach for safety-related SSCs

(iii) Normal Operation and Anticipated Operational Occurrences (AOOs)

- Consistent with existing requirements including Part 20 acceptance criteria
- Changes clarify applicability of requirements to normal operations

Subpart R – Licenses, Certifications, and Approvals

§ **53.4730(a)(5) Initiating events and accident analysis.**

(iv) Additional Licensing Basis Events

- Technology-inclusive requirements for relevant additional LBEs and analysis requirements for these events; similar to international defense-in-depth (DID) requirements
- Changes clarify scope of initiators and event sequences that must be considered and design requirements for SSCs used to mitigate additional LBEs

(v) Severe Accidents

- Derived from § 52.79(a)(38), with modifications to support technology-inclusiveness
- Definition of *severe nuclear accident* moved to § 53.028

(vi) Chemical hazard requirements address substances commingled with licensed material or those produced by a reaction with licensed material

Subpart R – Licenses, Certifications, and Approvals

§ **53.4730(a)(36) Containment requirements.**

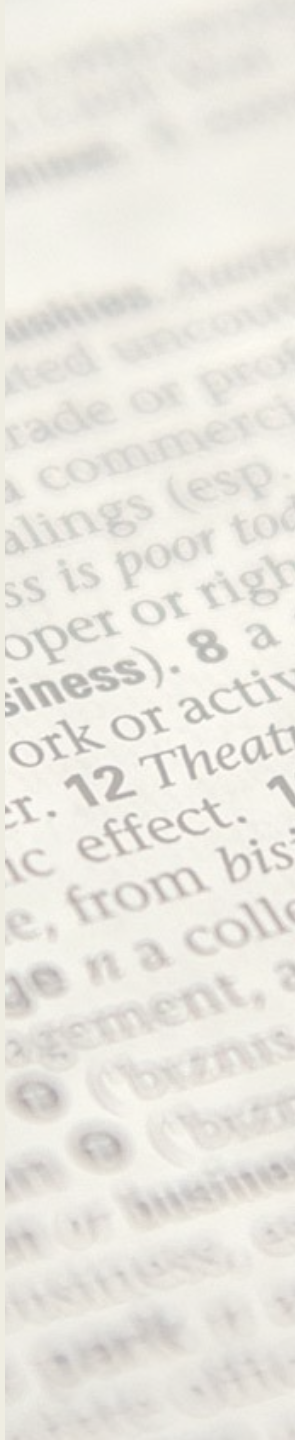
- Requirements split to acknowledge differences between non-LWR and LWR approaches to containment
- For non-LWRs, § 53.4730(a)(36)(i) addresses:
  - Set of barriers used to meet requirements for AOOs, DBAs, and siting criteria (functional containment)
  - Safety classification (i.e., safety-related) and qualification of SSCs making up functional containment barriers
  - Functional containment now defined in § 53.028
- For LWRs, § 53.4730(a)(36)(ii) addresses the need for a leak-tight primary containment that:
  - Meets the requirements of Part 50 Appendix J (also addressed in Subpart P)
  - Addresses any technically relevant requirements from LWR operating experience (containment isolation systems, penetrations, venting/purging)

Subpart R – Licenses, Certifications, and Approvals

Other General Technical Requirements

- § 53.4730(a)(2) Facility description.
- § 53.4730(a)(4) Design bases and principal design criteria.
- § 53.4730(a)(11) Dose to members of the public.
- § 53.4730(a)(14) Earthquake engineering criteria.
- § 53.4730(a)(34) Description of risk evaluation.
- § 53.4730(a)(37) Water-cooled reactor requirements.
- Changes to other paragraphs under § 53.4730 largely organization since last iteration was issued

10 CFR Part 53, Framework B Alternative Evaluation for Risk Insights, DG-1413, and DG-1414



Introduction

Katie Wagner
Division of Advanced Reactors and Non-Power Production and Utilization Facilities
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission

Agenda

- Introductions & Recent Activities
- Proposed AERI Entry Conditions
- Evaluation of Dose-Based AERI Entry Criteria Using MELCOR Accident Consequence Code System (MACCS)
- DG-1413 (proposed new RG 1.254), "Technology-Inclusive Identification of Licensing Events for Commercial Nuclear Plants"
- DG-1414 (proposed new RG 1.255), "Alternative Evaluation for Risk Insights (AERI) Methodology"

Introductions

- **Marty Stutzke** – Technical Lead of the Graded PRA Working Group (WG), Senior Level Advisor for Probabilistic Risk Assessment, Division of Advanced Reactors and Non-power Production and Utilization Facilities (DANU), Office of Nuclear Reactor Regulation (NRR)
- **Keith Compton** – Lead for MACCS calculations related to the AERI entry conditions, Senior Reactor Scientist, Division of Systems Analysis, Office of Nuclear Regulatory Research (RES)
- **Mihaela Biro** – Principal Author of DG-1413 (proposed new RG 1.254), "Technology-Inclusive Identification of Licensing Events for Commercial Nuclear Plants," Senior Reliability and Risk Analyst, Division of Risk Assessment (DRA), NRR
- **Anne-Marie Grady** – Principal Co-author of DG-1414 (proposed new RG 1.255), "Alternative Evaluation for Risk Insights (AERI) Methodology," Reliability and Risk Analyst, DRA, NRR
- **Katie Wagner** – Project Manager of the Graded PRA WG, Project Manager, DANU, NRR

The Graded PRA Working Group Membership

Project Manager

- Katie Wagner, NRR/DANU

Technical Lead

- Marty Stutzke, NRR/DANU

Working Group Members

- Hosung Ahn*, previously on rotation from NRR/Division of Engineering and External Hazard
- Mihaela Biro, NRR/DRA – Principal Author of DG-1413
- Anne-Marie Grady, NRR/DRA – Principal Co-Author of DG-1414
- Matt Humberstone, RES/DRA
- Ian Jung, NRR/DANU
- Alissa Neuhausen, NRR/DRA*^ – Principal Co-Author of DG-1414
- Hanh Phan, NRR/DANU
- Sunil Weerakkody, NRR/DRA

- Robert Budnitz, consultant

Management/Coordination

- Candace de Messieres, NRR/DANU^
- Steve Lynch, NRR/DANU
- Nathan Sanfilippo*
- John Segala, NRR/DANU

*Former WG member

^On rotation from current position

Recent Activities

- Latest ACRS Interactions and Communications
  - ACRS Subcommittee Meeting – June 23-24, 2022 (ML22172A091)
  - ACRS Full Committee Meeting – July 6, 2022 (ML22186A166)
  - ACRS Letter – August 2, 2022 (ML22196A292)
- Path forward discussion in late-June 2022
  - DG-1413 & DG-1414
    - Make revisions in response to ACRS and stakeholder feedback
    - Monitor changes to preliminary proposed rule text
  - DG-1414
    - Develop guidance for AERI maintenance and upgrades

AERI-Related Draft Proposed Rule Text and FRN Sections

Marty Stutzke
Division of Advanced Reactors and Non-Power Production and Utilization Facilities
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission

Regulatory Basis for the AERI Approach

Policy Statement on the Regulation of Advanced Reactors
73 FR 60612; October 14, 2008

73 FR 60616, left column: "The Commission also expects that advanced reactor designs will comply with the Commission's safety goal policy statement (51 FR 28044; August 4, 1986, as corrected and republished at 51 FR 30028; August 21, 1986),…"

73 FR 60614, left column: "…the Commission has also issued policy statements on the use of PRA in regulatory activities (60 FR 42622; August 16, 1995), and severe accidents regarding future designs and existing plants (50 FR 32138; August 8, 1985). The use of PRA as a design tool is implied by the policy statement on the use of PRA and the NRC believes that the current regulations and policy statements provide sufficient guidance to designers."

Policy Statement: Use of PRA Methods in Nuclear Regulatory Activities
60 FR 42622; August 16, 1995

60 FR 42628, middle column: "It is important to note that not all of the Commission's regulatory activities lend themselves to a risk analysis approach that utilizes fault tree methods. In general, a fault tree method is best suited for power reactor events that typically involve complex systems…the Commission recognizes that a single approach for incorporating risk analyses into the regulatory process is not appropriate."

use PRA or an alternative risk-informed approach as a design tool

AERI Elements

- Identify and characterize the postulated bounding event
- Demonstrate that the AERI entry conditions are met
- Develop a demonstrably conservative risk estimate
- Search for severe accident vulnerabilities
- Identify risk insights
- Evaluate DID adequacy

AERI-Related Draft Proposed Rule Text

The proposed AERI entry conditions are designed to limit use of the proposed AERI approach to commercial nuclear plants whose designs are relatively straightforward and do not involve overly complex systems and interactions and, accordingly, would not warrant development of a PRA to provide quantitative risk insights.

Draft Proposed Rule Text Presented to the ACRS Regulatory Rulemaking, Policies and Practices: Part 53 Subcommittee June 23-24, 2022

§ 53.4730(a)(34) *Description of risk evaluation*. A description of the risk evaluation developed for the commercial nuclear plant and its results. The risk evaluation must be based on:

(i) A PRA, or

(ii) An AERI, provided that the dose from a postulated bounding event to an individual located 100 meters (328 feet) away from the commercial nuclear plant does not exceed 1 rem total effective dose equivalent (TEDE) over the first four days following a release, an additional 2 rem TEDE in the first year, and 0.5 rem TEDE per year in the second and subsequent years.

Current Draft Proposed Rule Text

§ 53.4730(a)(34) *Description of risk evaluation.* A description of the risk evaluation developed for the commercial nuclear plant and its results. The risk evaluation must be based on:

(i) A probabilistic risk assessment (PRA); or

(ii) An alternative evaluation for risk insights (AERI), provided that:

(A) The analysis of a postulated bounding event demonstrates that the consequence evaluated at a location 100 meters (328 feet) away from the commercial nuclear plant does not exceed 10 mSv (1 rem) total effective dose equivalent (TEDE) over the first four days following a release, an additional 20 mSv (2 rem) TEDE in the first year, and 5 mSv (0.5 rem) TEDE per year in the second and subsequent years; and

(B) The qualification in § § 53.4730(a)(34)(ii)(A) is demonstrated to be met without reliance on active safety features or passive safety features except for those passive safety features that do not require any equipment actuation or operator action to perform their required safety functions, that are expected to survive accident conditions, and that cannot be made unavailable or otherwise defeated by credible human errors of commission and omission.

Changes to the AERI-Related Draft Proposed Rule Text

- 53.4730(a)(34)(ii)(A)
  - The consequence criteria in the AERI entry condition were originally inspired by the U.S. Environmental Protection Agency (EPA) Protective Action Guidelines (PAGs); however:
    - The EPA PAGs are used in response to an actual event; in contrast, the AERI entry conditions refer to a postulated bounding event that is used to help establish the licensing basis.
    - The Commission has never stated that the EPA PAGs are limits. In addition, the PAGs state: "…protective action guide doses represent trigger points for taking protective actions. They are not dose limits that cannot be exceeded."
    - Stakeholders may misconstrue the previous draft proposed AERI entry conditions to mean that it is an acceptable limit for an emergency dose to the public under accident conditions.
  - Changes to the draft proposed rule text were made during extensive discussions with the Office of Nuclear Security and Incident Response.
  - Conforming changes were made to the FRN preamble and to DG-1414.
- 53.4730(a)(34)(ii)(B)
  - Changes made in concert with changes to Part 53, Framework A, Subpart F concerning operator licensing.
  - Current draft proposed rule text is consistent with:
    - Draft staff white paper, "Risk-Informed and Performance-Based Human-System Considerations for Advanced Reactors," March 2021, ML21069A003
    - Section 2.7 of DOE-HDBK-1224-2018, "DOE Handbook: Hazard and Accident Analysis Handbook (Interim Use)," August 2018

Proposed Uses of the AERI Entry Conditions

- Would be used to determine:
  - Which applicants could develop an AERI in lieu of a PRA to demonstrate compliance with the proposed risk evaluation requirement in 53.4730(a)(34)
  - When the requirements to address the mitigation of beyond-design-basis events in 53.4420 must be met
  - When the requirements to address combustible gas control in 53.4730(a)(7) must be met
- In addition, the proposed AERI entry conditions would be used in combination with other conditions to determine when a commercial nuclear plant is a self-reliant mitigation facility, as provided in 53.800(a)(2)
  - A self-reliant mitigation facility may have generally licensed reactor operators (GLROs) in lieu of senior reactor operators (SROs) and reactor operators (ROs)

Maintenance of Risk Evaluations

§ 53.6052 Maintenance of risk evaluations.

Applicants or licensees required to submit a risk evaluation under § 53.4730(a)(34) must meet the following requirements:

(a) No later than the scheduled date for initial loading of fuel, each holder of an operating or combined license for a commercial nuclear plant under Framework B of this part must develop a risk evaluation.

(b) Each licensee required to develop a risk evaluation under paragraph (a) of this section must maintain the risk evaluation to reflect the as-built, as-operated facility. The risk evaluation must be maintained at least every five years until the permanent cessation of operations under § 53.4670. If a PRA is performed under § 53.4730(a)(34)(i), the licensee must upgrade the PRA to cover initiating events and modes of operation contained in consensus standards on PRA that are endorsed by the NRC. The upgrade must be completed within five years of NRC endorsement of the standard.

(c) Each licensee required to develop a risk evaluation based on a PRA must, no later than the date on which the licensee submits an application for a renewed license, upgrade the PRA required by paragraph (a) of this section to cover all modes and all initiating events.

(d) Each licensee who developed an alternative evaluation for risk insights under § 53.4730(a)(34)(ii) must, no later than the date on which the licensee submits an application for a renewed license, confirm that the alternative evaluation for risk insights reflects the as-built, as-operated facility.

Definitions from the non-LWR PRA standard (ASME/ANS Ra-S-1.4-2022)

- PRA maintenance: a change in the PRA that does not meet the definition of PRA upgrade.
  - Peer review not required by the standard
- PRA upgrade: a change in the PRA that results in the applicability of one or more supporting requirements or Capability Categories (e.g., the addition of a new hazard model) that were not previously assessed in a peer review of the PRA, an implementation of a PRA method in a different context, or the incorporation of a method not previously used.
  - Peer review required by the standard

Proposed AERI-Related FRN Questions

- The NRC is seeking comment on whether the NRC should retain this AERI approach under Framework B. If so, what changes, if any, would be recommended to the proposed criteria and approach in proposed Framework B? Please provide the considerations and rationale for your answer.
- Could the AERI criteria as written or potentially as revised and the related analyses of bounding events be used to support other regulatory decisions in Framework B (e.g., physical security, cyber security, AA (access authorization), FFD (fitness for duty) and emergency preparedness)? If so, which design areas and programs could logically use the AERI criteria and related analyses and how could requirements in those areas be scaled or graded based on the proposed 53.4730(a)(34)(ii) or a similar concept?
- The NRC is seeking comment on the criteria and how they are used in both justifying an alternative to PRAs and in allowing the use of GLROs, as well as possible alternatives to the proposed criteria. Please provide your considerations and rationale for your recommendation.

Evaluation of Dose-Based AERI Entry Criteria Using MACCS

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Division of Systems Analysis
Office of Nuclear Regulatory Research
U. S. Nuclear Regulatory Commission

Objectives

- Evaluate the relationship between dose computed at 100 m and the population-weighted individual latent cancer fatality risk (ILCFR) averaged over 10 miles using MACCS
  - Develop a closed-form analytic approximation to this relationship
  - Identify assumptions needed to develop the closed-form approximation
  - Test the impact of these assumptions using suitable calculations with MACCS

- **The analyses and results in this presentation provide a status report on work-in-progress. They do not represent the staff's final analyses or conclusions.**

Analytic Expression

Assumptions

- Individual doses from ingestion pathways are not explicitly considered
- The maximum individual dose δ_{max} at a distance r is assumed to be related to the maximum individual dose $\delta_{max,0}$ at the distance r_0 as follows:

  $$\partial(r, max) = \partial_{max,r0} \left(\frac{r}{r_o}\right)^{-n}$$

- All material is released in a single plume (i.e., there are no wind shifts during release)
- The population density ρ_N is assumed to be constant and independent of distance r
- The latent cancer proportionality constant γ is assumed to be constant and independent of dose

Downwind Dose Reduction Coefficient

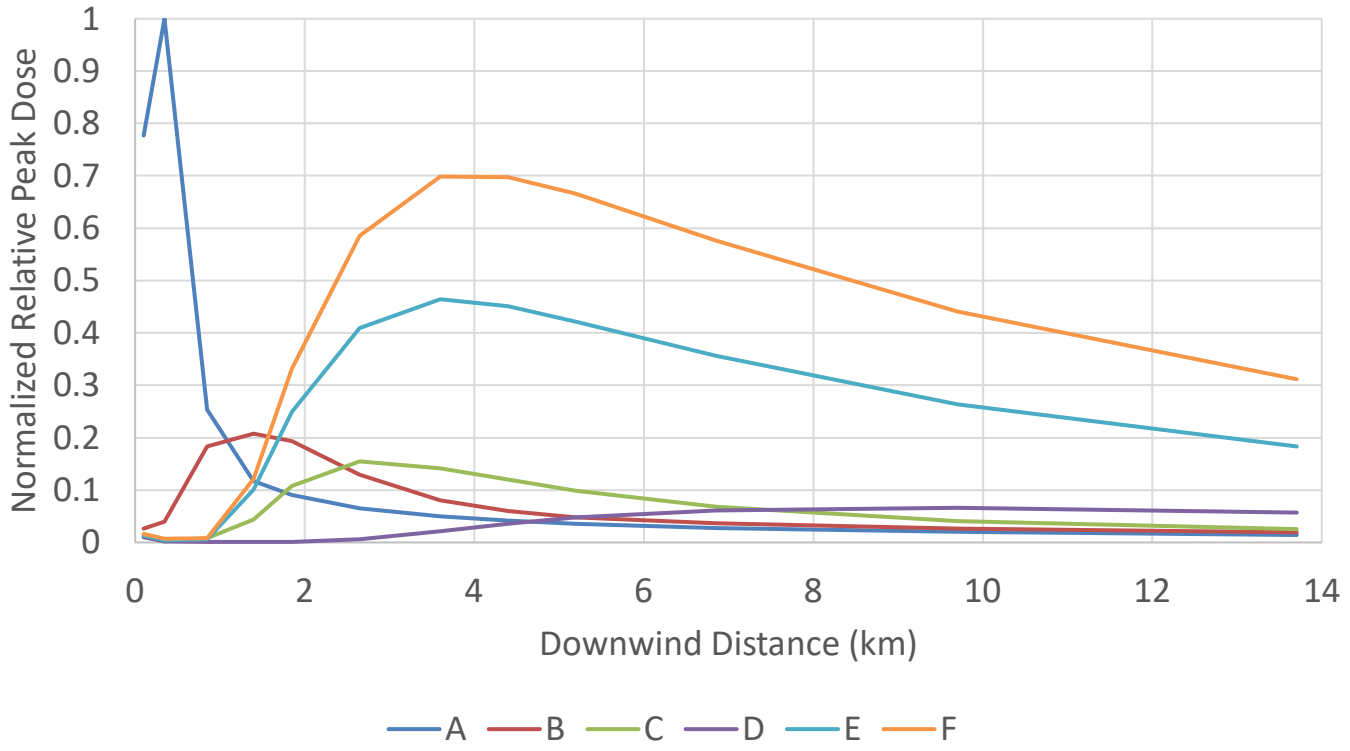
The maximum individual dose δ_{max} at a distance r is assumed to be related to the maximum individual dose $\delta_{max,0}$ at the distance r_0 as follows:

$$\partial(r, max) = \partial_{max,r0}\left(\frac{r}{r_o}\right)^{-n}$$

Subsidiary Assumption	Rationale
The release is from ground level and non-bouyant (i.e., $\partial(r,max)$ is monotonically decreasing)	Elevated releases or plume rise will result in an increase in concentration at short downwind distances as the plume disperses overhead before contacting ground
Protective actions to limit dose are not taken	Protective actions may constrain dose at short downwind distances
The plume is completely reflected at the ground surface and is unconstrained by a mixing height	Highly unstable conditions can result in rapid vertical dispersion to the top of the mixing layer due to insolation of ground surface
The dose-distance reduction coefficient n is assumed to be independent of distance r.	Although crosswind (transverse) dispersion is typically represented as a power law, vertical dispersion does not follow a power law relationship with distance

Downwind Dose Reduction Coefficient

Elevated/Buoyant Plume



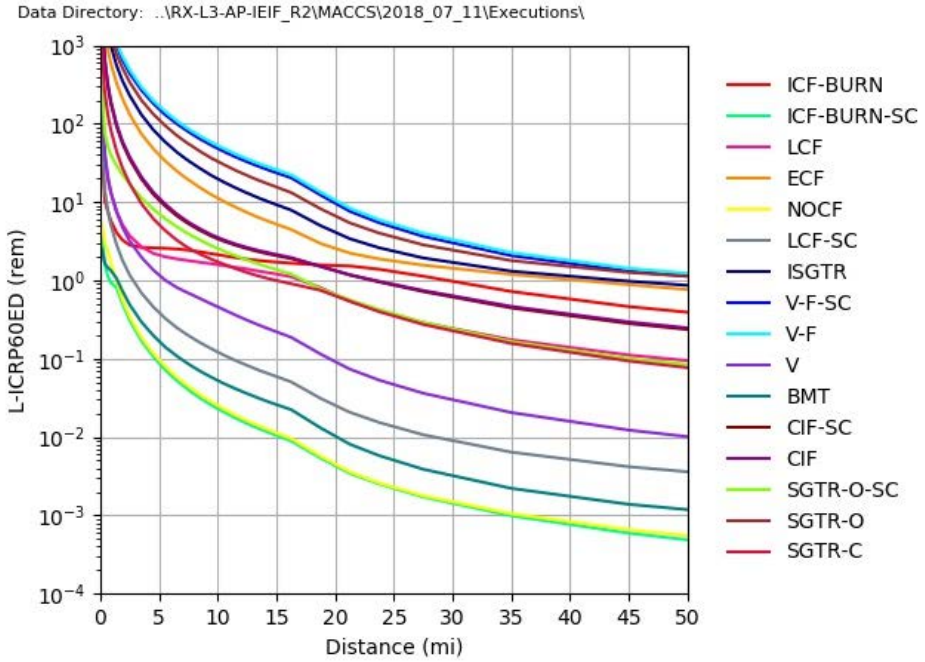
Normalized relative peak dose as a function of downwind distance and stability class

Normalized to a constant core scaling factor and maximum peak dose

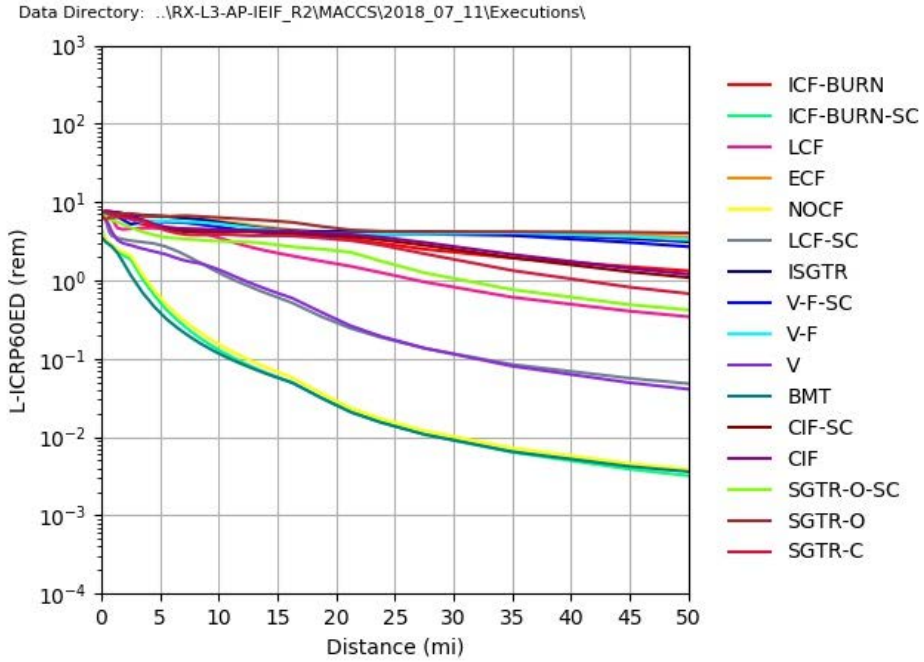
Downwind Dose Reduction Coefficient

Effect of Protective Actions

- The flatness of the ICF-BURN (red) curve out to 20 miles, and the latent cancer fatality (LCF) (magenta) curve out to 15 miles, is due to early-phase hotspot relocation within 12 hours coupled with a relatively prolonged release
- Doses incurred during the late phase are low near the site, but do not appreciably decline with distance from the site for the most severe scenarios.



Mean value (across all weather trials) of peak total effective dose (rem) from early-phase exposure to the non-evacuating cohort

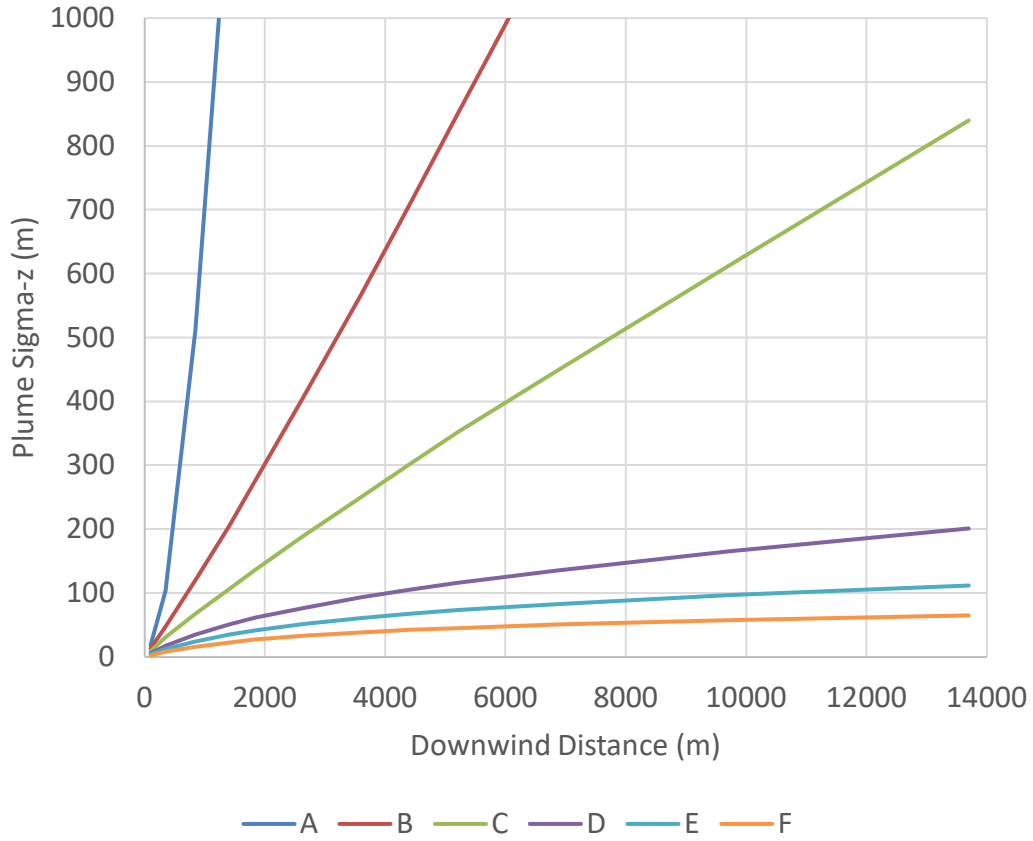


Mean value (across all weather trials) of peak total effective dose (rem) from late-phase exposure

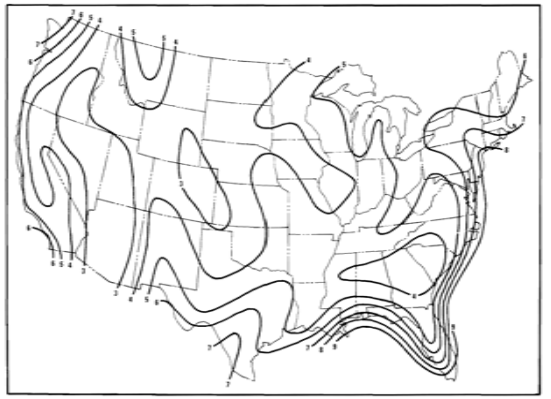
Source: NRC 2022

Downwind Dose Reduction Coefficient

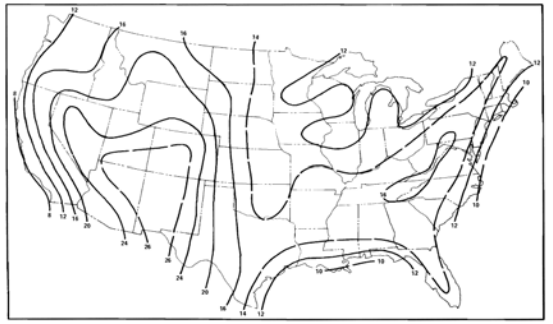
Mixing Height



Plume sigma z (m) as a function of downwind distance



Isopleths of mean annual morning mixing height ($m*10^{-2}$) as a function of downwind distance
Isopleth levels: 300 - 900 m

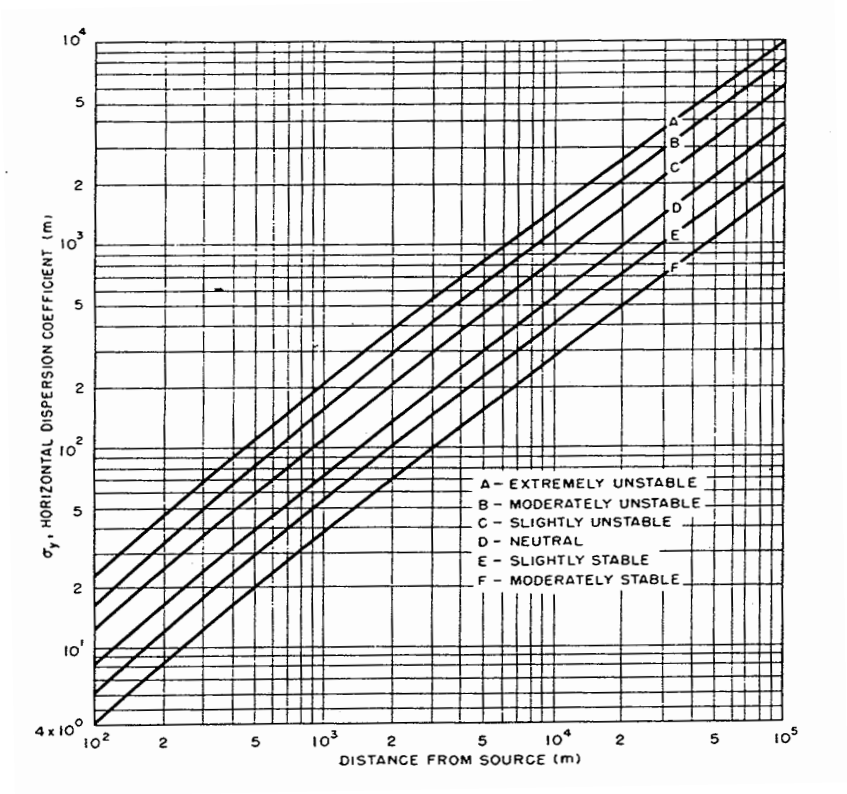


Isopleths of mean annual afternoon mixing height ($m*10^{-2}$) as a function of downwind distance
Isopleth levels: 800 – 2600 m

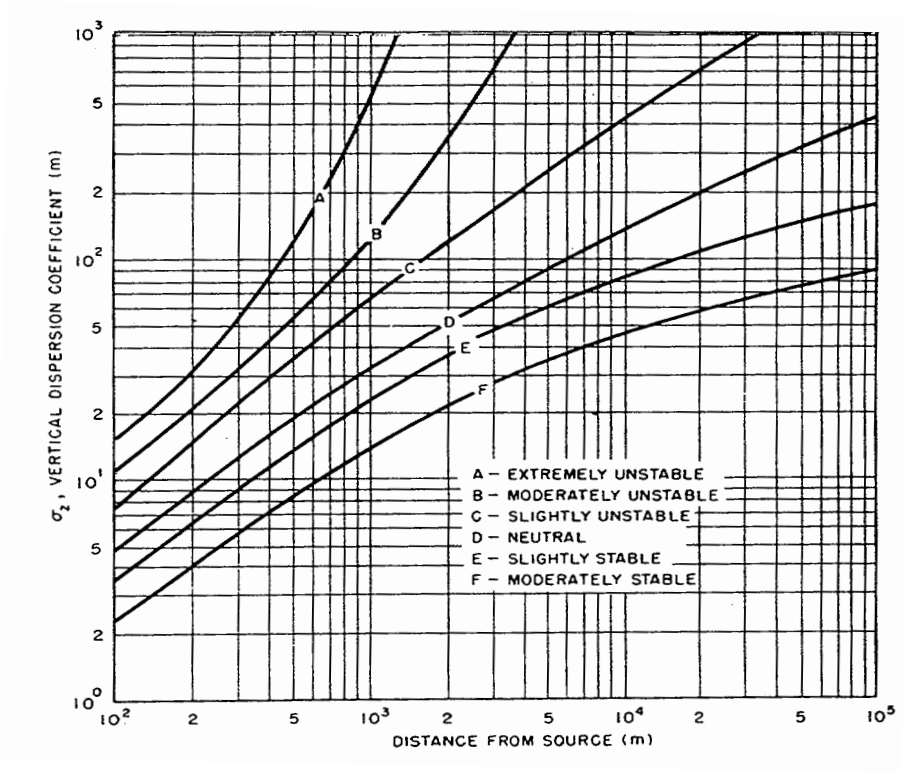
Sources: Case 2 Model Output Files; Holzworth 1972

Downwind Dose Reduction Coefficient

Power Law Coefficient with Distance



Lateral diffusion without meander and building wake effects (σ_y) vs. downwind distance from source for Pasquill's turbulence types (atmospheric stability)



Vertical diffusion without meander and building wake effects (σ_z) vs. downwind distance from source for Pasquill's turbulence types (atmospheric stability)

Source: Reference 7 of NRC 1983

Single Plume Azimuthal Correction Factor

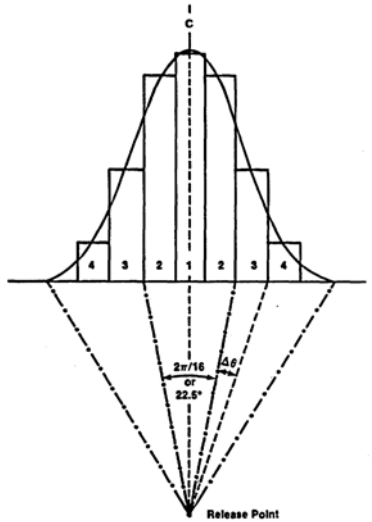
- A single plume azimuthal correction factor φ(r) is defined as the ratio between peak individual dose δ_{max} from a single plume at a distance r and the individual dose δ averaged across the circumference of a circle of radius r.

- Assuming (Tadmor and Gur, 1969) that the crosswind dispersion factor may be represented as a power function given by $\sigma_y = A_y r^{B_y}$, the azimuthal correction factor may be represented as:

$$\varphi(r) = \frac{A_y r^{B_y}}{\sqrt{2\pi} r} = \frac{A_y}{\sqrt{2\pi}} r^{(B_y - 1)}$$

- An alternative would be to simply assume that the crosswind plume spread may be represented by a "tophat" with a width of one 22.5º sector, resulting in an azimuthal correction factor of 0.0625 (1/16)

Figure Source: Jow et al. 1990



Stability Class	Ay	By	$\varphi(r)$ 100 m	$\varphi(r)$ 10 mi
A	0.3658	0.9031	0.0934	0.0571
B	0.2751	0.9031	0.0702	0.0429
C	0.2089	0.9031	0.0533	0.0326
D	0.1471	0.9031	0.0376	0.0230
E	0.1046	0.9031	0.0267	0.0163
F	0.0722	0.9031	0.0184	0.0113
G	0.0481	0.9031	0.0123	0.0075

Maximum Dose vs Average Dose / Risk over an Annular Region

For n≠B_y+1, the average individual dose $\overline{\partial(x)}$ in the annular region between r_0 and x may be expressed as:

$$\overline{\partial(x)} = \frac{2A_y {r_o}^n \left(x^{B_y-n+1} - {r_0}^{B_y-n+1}\right)}{\sqrt{2\pi}(x^2 - {r_0}^2)(B_y - n + 1)} \partial_{max,r0}$$

The average individual cancer risk $\overline{R(x)}$ in the annular region between r_0 and x may be expressed as :

$$\overline{R(x)} = \frac{2A_y {r_o}^n \left(x^{B_y-n+1} - {r_0}^{B_y-n+1}\right)}{\sqrt{2\pi}(x^2 - {r_0}^2)(B_y - n + 1)} \partial_{max,r0}\, \gamma$$

Where:

- A_y is the power law linear coefficient for transverse dispersion
- B_y is the power law exponent for transverse dispersion
- $\partial_{max,r0}$ is the peak centerline dose at the inner annular radius (e.g., 100 m)
- r_0 is the inner annular radius (e.g., 100 m)
- x is the outer annular radius (e.g., 16,090 m (10 mi))
- n is the downwind dose reduction coefficient

Approach

- Develop a set of MACCS modeling cases to quantitatively examine impact of assumptions
- Use source terms from NRC Level 3 PRA reactor at-power internal events and internal floods Level 2 analyses to represent a range of source term compositions
- Apply scaling factors to source terms to yield a 25 rem (0.25 Sv) lifetime* dose at 100 m
- Use combinations of constant weather conditions, constant population density, and meteorological and site files from SOARCA (state-of-the-art reactor consequence analyses) analyses to examine impact of variability in weather condition and population density

** Lifetime dose, in this analysis, is assumed to be the dose resulting from a 96-hour (4 day) early phase exposure and a 50-year late phase exposure.*

Summary of Source Terms

Source Term Characteristics

- All source terms are inventory-scaled to yield 25 rem overall (EARLY+CHRONC) dose at 100 m
- Base case plume is based on intersystem loss-of-coolant accident (VF/5D) source term
- Scaled source terms may vary in relative radionuclide composition and release duration
- Single segment plume are created by summing/averaging properties for individual plume segments. Multi-plume releases capture the time dependence of the release.

RC	Case	Release Category Description	NUMREL	PDELAY (hr)	PLUDUR (50%) (hr)	PLUDUR (100%) (hr)	PLHITE (m)	PLHEAT (MW)
VF	5D	Unscrubbed interfacing systems loss-of-coolant accident with auxiliary building failure	86	3.2	4.5	68.8	11	19
LCF	1B	Late containment due to long-term quasi-static overpressure, unscrubbed	179	48	32.1	120.0	0.36	5.9
NOCF	2R1	Containment is not bypassed or failed, and radiological release to the environment occurs via design-basis containment leakage only.	199	13	89.9	154.5	32	0.0026

RC	Case	Xe	Cs	Ba	I	Te	Ru	Mo	Ce	La
VF	5D	8.6E-01	1.3E-01	2.1E-03	1.4E-01	1.3E-01	2.6E-03	3.3E-02	9.3E-05	2.7E-06
LCF	1B	9.1E-01	9.9E-03	3.0E-04	1.2E-02	1.1E-02	6.6E-06	4.0E-02	1.4E-06	5.8E-07
NOCF	2R1	1.0E-02	7.4E-05	2.4E-06	8.5E-05	7.9E-05	3.7E-06	2.0E-04	2.3E-08	2.0E-08

Source: adapted from Tables 3.1-1 and A.1a in NRC 2022

Summary of Modeling Cases

- Modeling cases designed to test effect of key assumptions related to plume rise, wake effects, protective actions, plume segmentation, weather variability, and population density

Case	Dose Reduction Coefficient	Effects	Azimuthal Variation	Population Density
0A-F*	Single Stabilities - A-F	Power Law Stability	Single Plume - VF	Constant
1A-F*	Single Stabilities - A-F	Pasquill-Gifford Stability	Single Plume - VF	Constant
2A-F*	Single Stabilities - A-F	Plume Rise	Single Plume - VF	Constant
3A-F*	Single Stabilities - A-F	Wake Effects	Single Plume - VF	Constant
4A-F*	Single Stabilities - A-F	Protective Actions	Single Plume - VF	Constant
5A-B	Met Sampling - PB	None/Plume Rise	Single Plume - VF	Constant
6A-C	Met Sampling - PB	None	Multiplume - VF/LCF/NOCF	Constant
7A-C	Met Sampling - PB	None	Multiplume - VF/LCF/NOCF	PB

** Each stability class (A-F) represent a separate subcase for these cases. For example, Case 2A represents Case 2 with stability class A, Case 3F represents Case 3 with stability class F, etc.*

Case 0: Simple Model

Results

- Simplest Case
  - Power law representation for σ_Y and σ_z with constant parameters
  - Constant weather conditions – specified stabilities, 2.5 m/s, no rain, mixing layer depth 10 km
  - Constant deposition velocity (0.003 m/s)
  - Single plume – scaled VF source term, ground level release with no plume buoyancy (plume heat of 0 MW)
  - Uniform population density with no protective actions
  - Single cancer risk coefficient based on total effective dose
- "Fitted n" derived from power law regression of MACCS results (see supplemental slides)
- Lifetime dose of 25 rem yields 10-mile ILCFR from 3.6e-8 to 3.4e-7
- All cases produce MACCS ILFCR <2e-6
- Difference between MACCS and analytic calculation ranges from 3.6% to 470%

Case	OVERALL Peak dose (Sv) at 100 m	EARLY Peak dose (Sv) at 100 m	CHRONC Peak dose (Sv) at 100 m	MACCS 10- mile ILCFR	P-G n	MACCS fitted n	Analytic 10-mile ILCFR	Percent Difference
0A	0.25	0.02	0.23	3.6E-08	3.0	2.4	2.0E-07	470%
0B	0.25	0.02	0.23	5.5E-08	2.5	2.4	1.4E-07	160%
0C	0.25	0.02	0.23	2.9E-07	1.8	1.8	4.2E-07	47%
0D	0.25	0.02	0.23	3.4E-07	1.6	1.6	4.6E-07	32%
0E	0.25	0.02	0.23	2.9E-07	1.5	1.6	3.6E-07	21%
0F	0.25	0.02	0.23	2.0E-07	1.5	1.7	2.0E-07	3.6%

Case 1: Pasquill-Gifford Stability

Results

- Differences from Case 0:
  - 1000-m deep boundary layer
  - Eimutis and Konicek representation for σ_Y and σ_z with spatially variable parameters for σ_z
  - Particle-size-dependent deposition velocity
  - Organ-specific cancer risk coefficients
- Lifetime dose of 25 rem yields 10-mile ILCFR from 1.4e-7 to 3.3e-7
- Difference between MACCS and analytic calculation ranges from 40% to 264%
- Analytic calculation is conservative relative to MACCS calculation
- All cases produce MACCS ILFCR <2e-6

Case	OVERALL Peak dose (Sv) at 100 m	EARLY Peak dose (Sv) at 100 m	CHRONC Peak dose (Sv) at 100 m	MACCS 10- mile ILCFR	P-G n	MACCS fitted n	Analytic 10-mile ILCFR	Percent Difference
1A	2.5E-01	2.3E-02	2.3E-01	3.3E-07	3.0	1.6	1.2E-06	260%
2B	2.5E-01	2.3E-02	2.3E-01	2.5E-07	2.5	1.8	5.0E-07	100%
2C	2.5E-01	2.3E-02	2.3E-01	2.2E-07	1.8	1.8	3.7E-07	68%
2D	2.5E-01	2.4E-02	2.3E-01	2.4E-07	1.6	1.7	4.0E-07	65%
2E	2.5E-01	2.5E-02	2.3E-01	2.0E-07	1.5	1.7	3.1E-07	54%
2F	2.5E-01	2.7E-02	2.2E-01	1.4E-07	1.5	1.7	1.9E-07	40%

Case 2: Plume Buoyancy

Results

- Difference from Case 1: Ground-level release with plume buoyancy based on 19 MW plume heat
- Lifetime dose of 25 rem yields 10-mile ILCFR from 2.5e-5 to 6.1 e-3
- Difference between MACCS and analytic calculation ranges from 38% to 566%
- Analytic calculation can be either conservative or non-conservative relative to MACCS calculation
- All cases produce MACCS ILFCR > 2e-6

Case	OVERALL Peak dose (Sv) at 100 m	EARLY Peak dose (Sv) at 100 m	CHRONC Peak dose (Sv) at 100 m	MACCS 10- mile ILCFR	MACCS fitted n	Analytic 10-mile ILCFR	Percent Difference
2A	2.5E-01	2.6E-02	2.3E-01	2.5E-05	0.9	1.6E-05	-38%
2B	2.5E-01	1.0E-01	1.5E-01	8.0E-04	0.1	4.3E-04	-47%
2C	2.5E-01	2.5E-01	4.9E-04	2.3E-03	-0.6	8.0E-03	244%
2D	2.5E-01	2.5E-01	9.8E-13	1.9E-03	-0.8	1.3E-02	566%
2E	2.5E-01	2.5E-01	0.0E+00	5.4E-03	-1.0	2.3E-02	331%
2F	2.5E-01	2.5E-01	0.0E+00	6.1E-03	-1.0	2.2E-02	256%

Case 3: Wake Effects

Results

- Difference from Case 1: Eimutis and Konicek representation for σ_Y and σ_z coupled with Ramsdell-Fosmire model for plume meander and wake effects
- Lifetime dose of 25 rem yields 10-mile ILCFR from 5.5e-7 to 1.9e-6
- Difference between MACCS and analytic calculation ranges from 3% to 210%
- Analytic calculation generally conservative relative to MACCS calculation
- All cases produce MACCS ILFCR <2e-6

Case	OVERALL Peak dose (Sv) at 100 m	EARLY Peak dose (Sv) at 100 m	CHRONC Peak dose (Sv) at 100 m	MACCS 10- mile ILCFR	MACCS fitted n	Analytic 10-mile ILCFR	Percent Difference
3A	2.5E-01	2.3E-02	2.3E-01	5.5E-07	1.5	1.7E-06	210%
3B	2.5E-01	2.3E-02	2.3E-01	5.3E-07	1.7	8.1E-07	53%
3C	2.5E-01	2.3E-02	2.3E-01	6.3E-07	1.6	7.3E-07	16%
3D	2.5E-01	2.3E-02	2.3E-01	1.2E-06	1.3	1.3E-06	13%
3E	2.5E-01	2.3E-02	2.3E-01	1.5E-06	1.2	1.5E-06	2.7%
3F	2.5E-01	2.3E-02	2.3E-01	1.9E-06	1.1	1.7E-06	-11%

Case 4: Protective Actions

Results

- Difference from Case 1: Early phase relocation at 1-5 rem and late phase interdiction/decontamination at 2 rem in first year and 500 mrem in second year
- Lifetime dose of 25 rem yields 10-mile ILCFR from 1.5e-6 to 4.1e-6
- Difference between MACCS and analytic calculation ranges from 17% to 47%
- Analytic calculation is generally non-conservative relative to MACCS calculation
- Most cases produce MACCS ILFCR >2e-6

Case	OVERALL Peak dose (Sv) at 100 m	EARLY Peak dose (Sv) at 100 m	CHRONC Peak dose (Sv) at 100 m	MACCS 10- mile ILCFR	MACCS fitted n	Analytic 10-mile ILCFR	Percent Difference
4A	2.5E-01	1.9E-01	6.1E-02	4.1E-06	1.2	6.0E-06	47%
4B	2.5E-01	1.9E-01	6.1E-02	3.1E-06	1.4	2.2E-06	-29%
4C	2.5E-01	1.9E-01	6.0E-02	2.6E-06	1.3	1.8E-06	-31%
4D	2.5E-01	1.9E-01	6.0E-02	2.8E-06	1.2	2.3E-06	-17%
4E	2.5E-01	1.9E-01	5.9E-02	2.2E-06	1.2	1.7E-06	-23%
4F	2.5E-01	1.9E-01	5.7E-02	1.5E-06	1.2	9.1E-07	-38%

Case 5: Meteorological Sampling

Results

- Difference from Case 1: Weather sampled from SOARCA Peach Bottom meteorological file without (5A) and with (5B) plume buoyancy
- Lifetime dose of 25 rem yields 10-mile ILCFR from 1.3e-7 to 1.4e-6
- Difference between MACCS and analytic calculation ranges from 220% to 240%
- Analytic calculation is conservative relative to MACCS calculation

Case	OVERALL Peak dose (Sv) at 100 m	EARLY Peak dose (Sv) at 100 m	CHRONC Peak dose (Sv) at 100 m	MACCS 10- mile ILCFR	MACCS fitted n	Analytic 10-mile ILCFR*	Percent Difference
5A	2.5E-01	2.7E-02	2.2E-01	1.3E-07	1.8	4.5E-07	238%
5B	2.5E-01	2.3E-02	2.3E-01	1.4E-06	1.1	4.5E-06	222%

* Transverse dispersion assumed consistent with slightly unstable conditions

Case 6: Multiple Plumes

Results

- Difference from Case 1:
  - Weather sampled from SOARCA Peach Bottom meteorological file
  - Multiple plume segments – scaled VF (6A) / LCF (6B) / NOCF (6C) source terms
- Lifetime dose of 25 rem yields 10-mile ILCFR from1.3e-7 to 2.9e-7 for different source terms
- Difference between MACCS and analytic calculation ranges from 45% to 460% for different source terms
- Analytic calculation is conservative relative to MACCS calculation
- MACCS ILCFR is comparable to Case 5 (single plume) for source term 5D

Case	OVERALL Peak dose (Sv) at 100 m	EARLY Peak dose (Sv) at 100 m	CHRONC Peak dose (Sv) at 100 m	MACCS 10- mile ILCFR	MACCS fitted n	Analytic 10-mile ILCFR*	Percent Difference
6A	2.5E-01	2.2E-02	2.3E-01	1.3E-07	1.8	7.0E-07	460%
6B	2.5E-01	1.8E-02	2.3E-01	2.9E-07	2.0	4.3E-07	45%
6C	2.5E-01	6.7E-03	2.4E-01	1.3E-07	2.0	4.0E-07	210%

* Transverse dispersion assumed consistent with highly unstable conditions

Case 7: Population Distribution

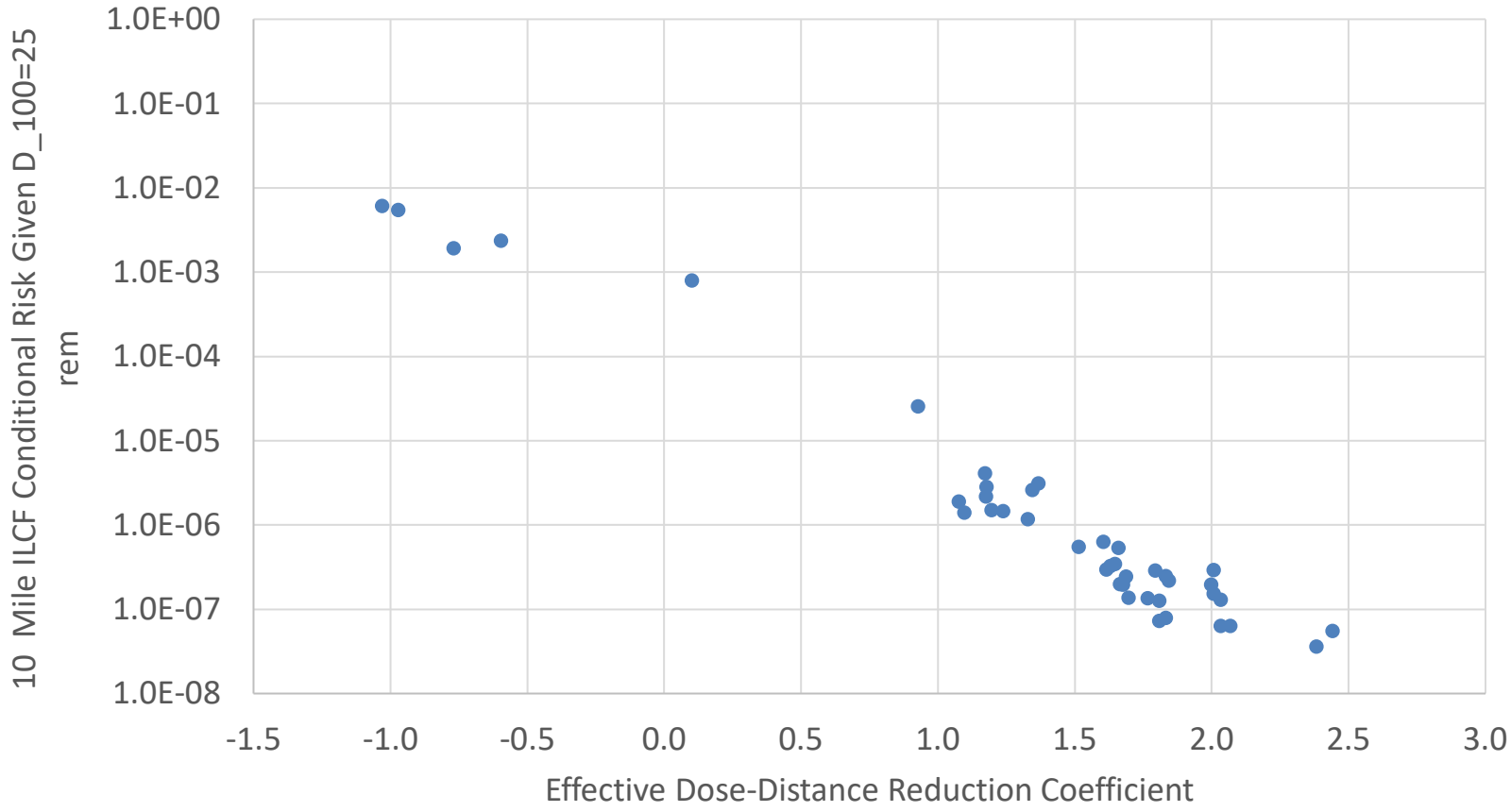
Results

- Difference from Case 1:
  - Weather sampled from SOARCA Peach Bottom meteorological file
  - Multiple plume segments – scaled VF (7A) / LCF (7B) / NOCF (7C) source terms
  - Population distribution based on Peach Bottom site file
- Lifetime dose of 25 rem yields 10-mile ILCFR from 6.3e-8 to 1.5e-7 for different source terms
- Difference between MACCS and analytic calculation ranges from 180% to 866%
- Realistic population distribution resulted on lower ILCFR relative to Case 6, particularly for “pulse” type releases such as VF/5D.

Case	OVERALL Peak dose (Sv) at 100 m	EARLY Peak dose (Sv) at 100 m	CHRONC Peak dose (Sv) at 100 m	MACCS 10- mile ILCFR	MACCS fitted n	Analytic 10-mile ILCFR*	Percent Difference
7A	2.5E-01	2.2E-02	2.3E-01	7.3E-08	1.8	7.0E-07	866%
7B	2.5E-01	1.8E-02	2.3E-01	1.5E-07	2.0	4.3E-07	180%
7C	2.5E-01	6.7E-03	2.4E-01	6.3E-08	2.0	4.0E-07	537%

** Transverse dispersion assumed consistent with highly unstable conditions*

Effect of Downwind Dose Reduction Coefficient on Individual Latent Fatality Risk within 10 miles



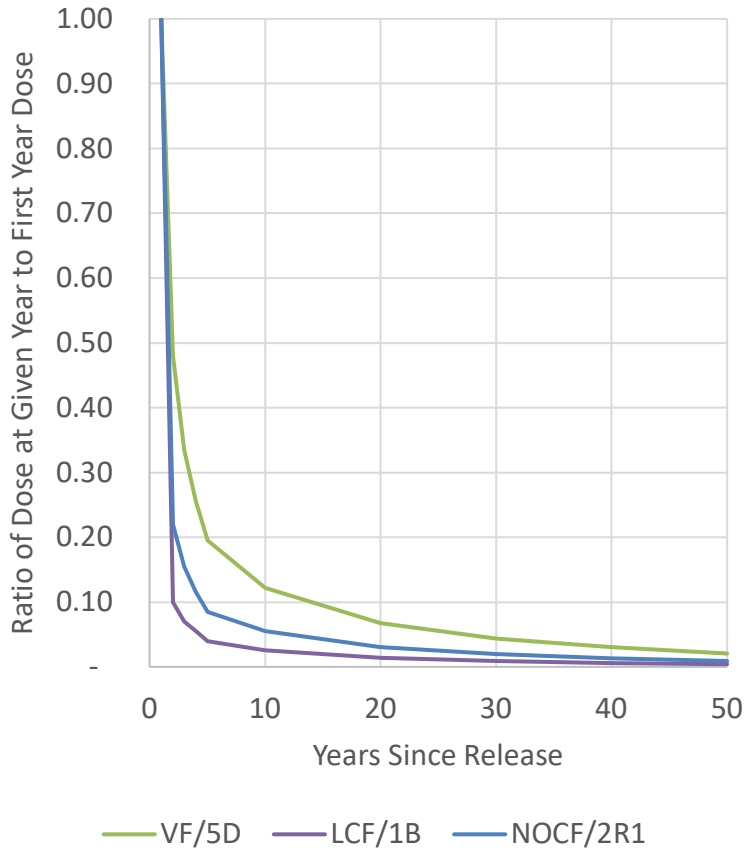
Long-Term Time Dependence of Dose

- Accumulation of dose in years after the event occurs at different rates for different source terms
- Therefore, there is likely no fixed ratio between early phase dose, first year dose, and 50-year cumulative dose
- However, for the scaled source terms considered in this analysis, a first-year dose of 2 rem appears to correspond to a lifetime dose* less than 25 rem, probably due to radioactive decay and the effect of weathering on groundshine and resuspension

Case	Early Phase	First Year CHRONC	Second Year CHRONC	50 year Cumul CHRONC*	50 year Cumul TOTAL*
PAGs	1-5	2	0.5	Not specified	Not specified
VF/5D	0.70	2.0	1.0	9.0	9.7
LCF/1B	0.13	2.0	0.2	3.5	3.6
NOCF/2R1	0.11	2.0	0.4	5.2	5.3

** Cumul.: cumulative*

** Lifetime dose, in this analysis, is assumed to be the dose resulting from a 96-hour (4 day) early phase exposure and a 50-year late phase exposure.*



Summary

- Analytic derivation of relationship between 100 m lifetime dose and 10-mile population-weighted ILCFR developed and used to identify assumptions for examination with MACCS.
- A 25-rem lifetime dose at 100 meters generally corresponds to a 10-mile population-weighted lifetime ILCFR less than 2e-6, unless buoyant releases or protective actions are credited for computing dose at 100 m.
- The relationship is sensitive to the value used for the downwind dose reduction coefficient.
- There is likely no fixed ratio between early phase dose, first year dose, and 50-year cumulative dose.
- For the scaled source terms considered in this analysis, a first-year dose of 2 rem appears to correspond to a 50-year dose less than 25 rem, probably due to radioactive decay and the effect of weathering on groundshine and resuspension.

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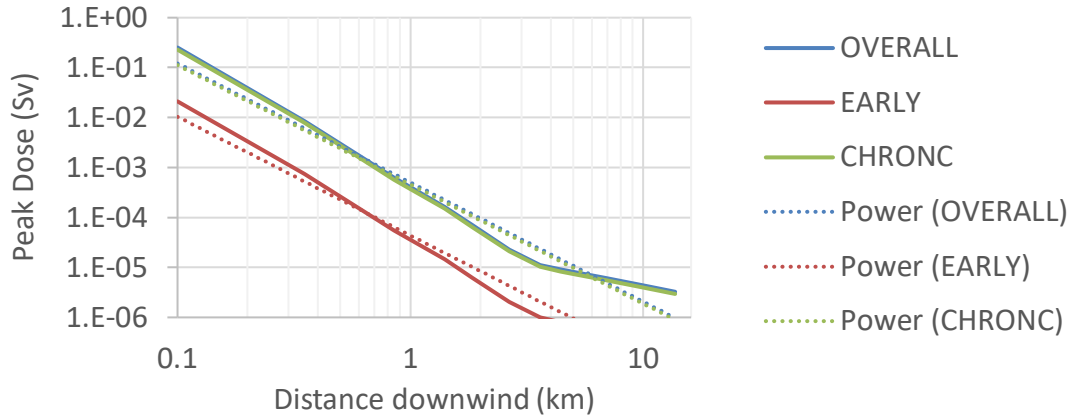
Confirmatory MACCS Calculations
Supplemental Slides

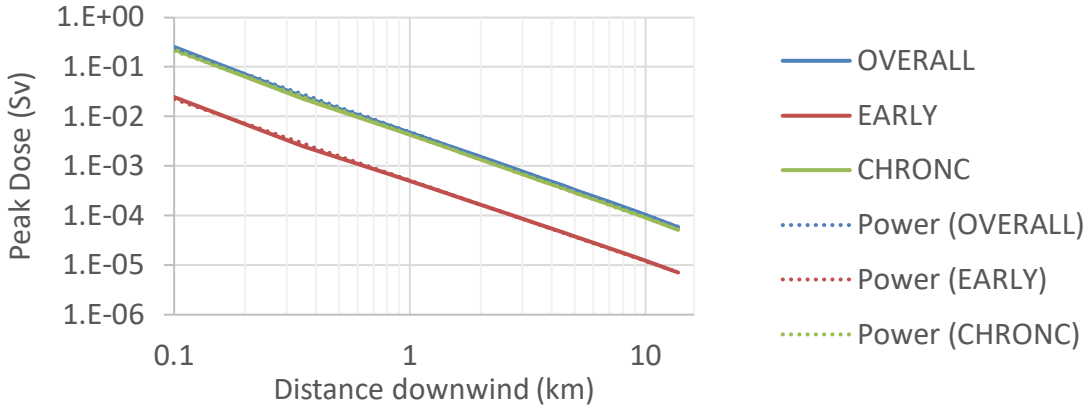
Case 0: Simple Model

Peak Dose vs Distance

Stability Class A:
Extremely Unstable



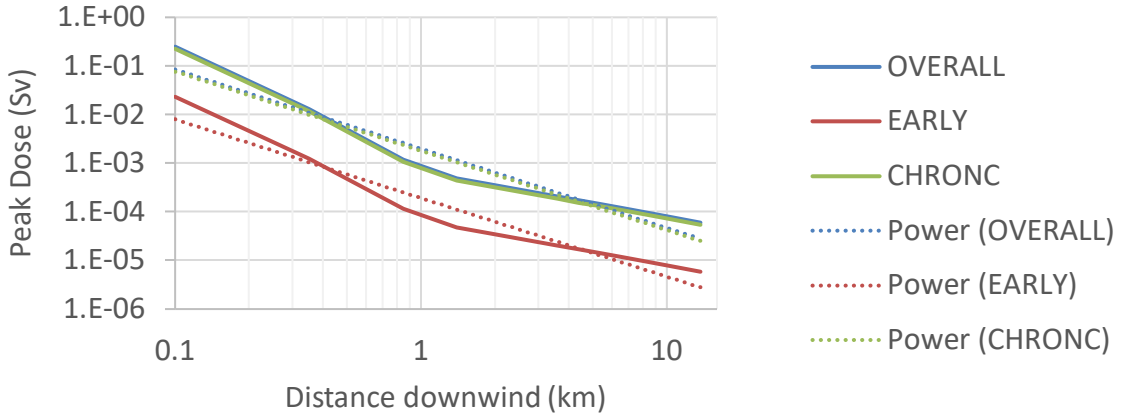
Stability Class F:
Strongly Stable



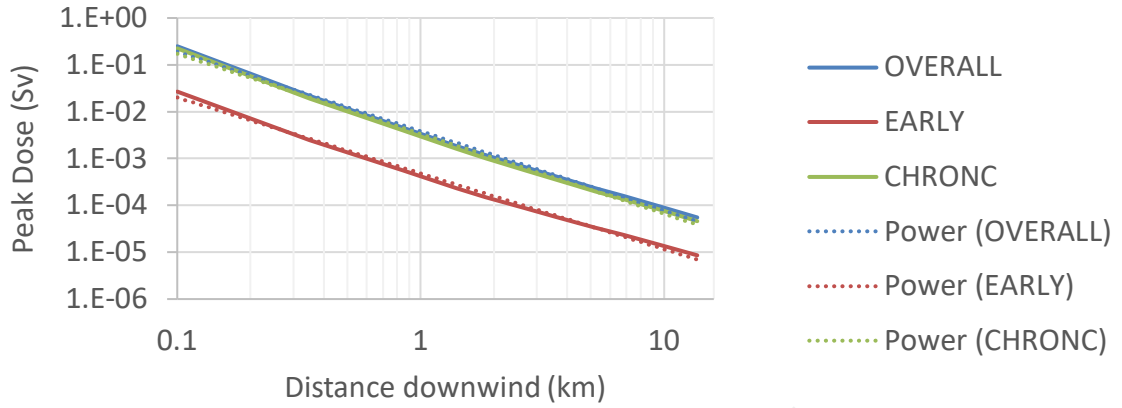
Case 1: Pasquill-Gifford Stability

Peak Dose vs Distance

Stability Class A:
Extremely Unstable



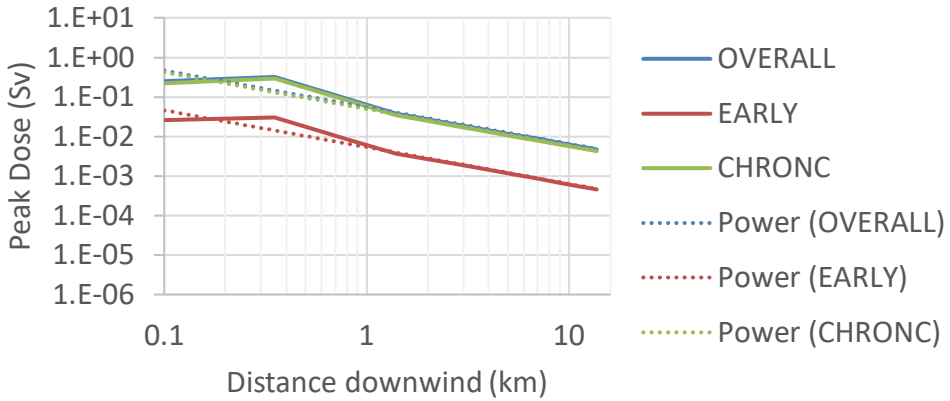
Stability Class F:
Strongly Stable



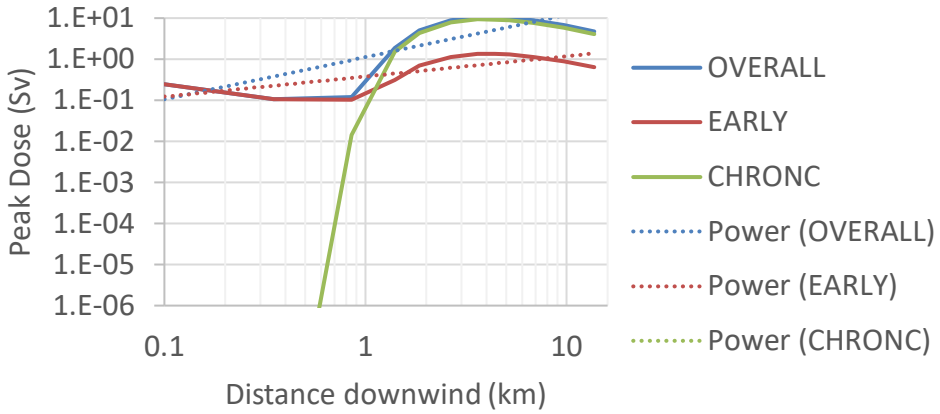
Case 2: Plume Buoyancy

Peak Dose vs Distance

Stability Class A:
Extremely Unstable



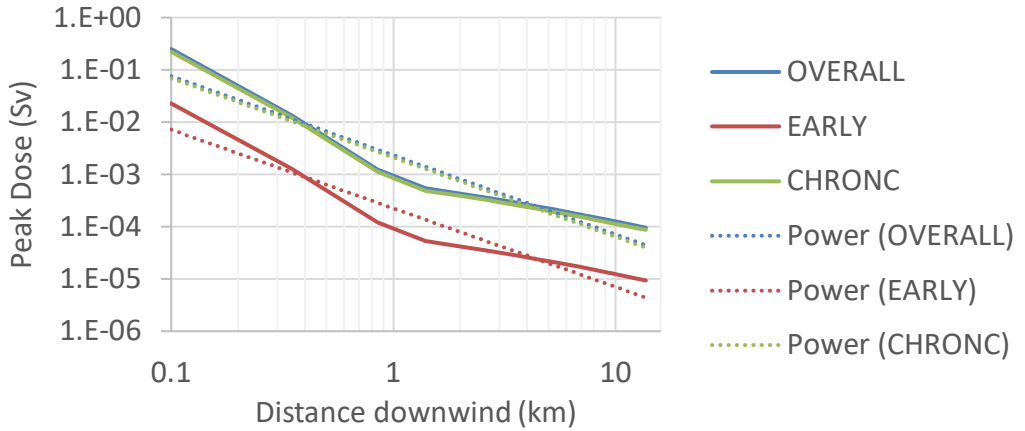
Stability Class F:
Strongly Stable



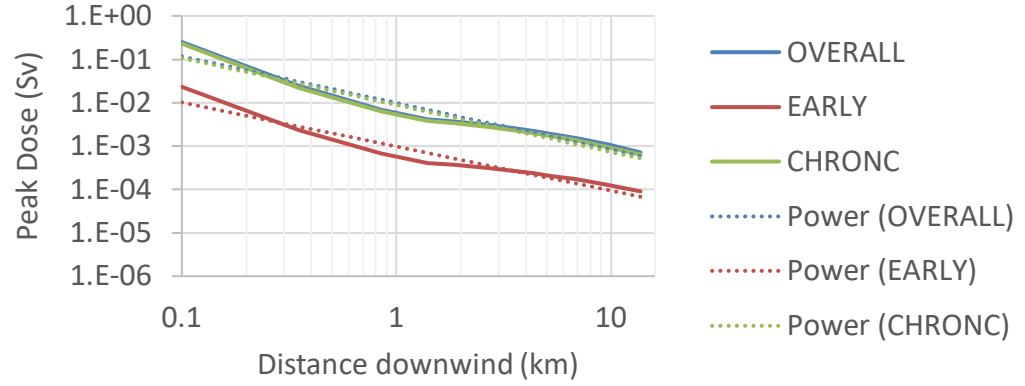
Case 3: Wake Effects

Peak Dose vs Distance

Stability Class A:
Extremely Unstable



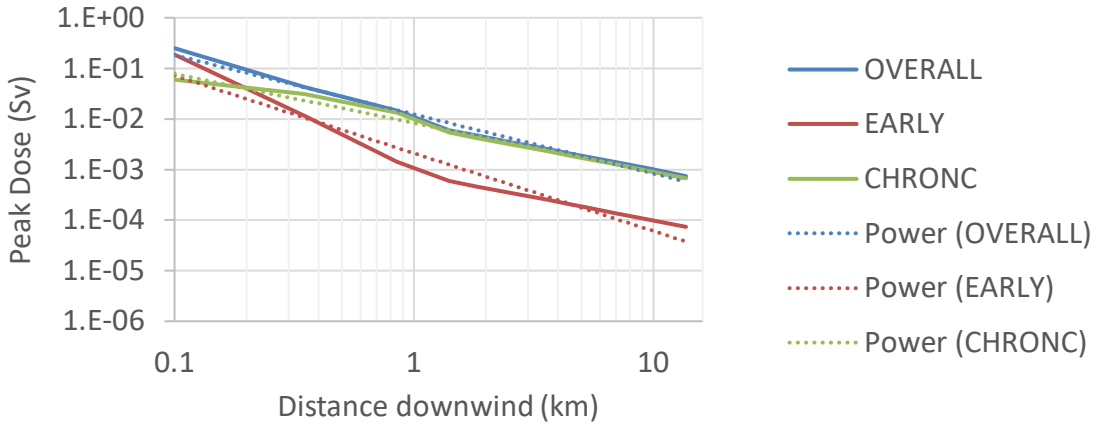
Stability Class F:
Strongly Stable



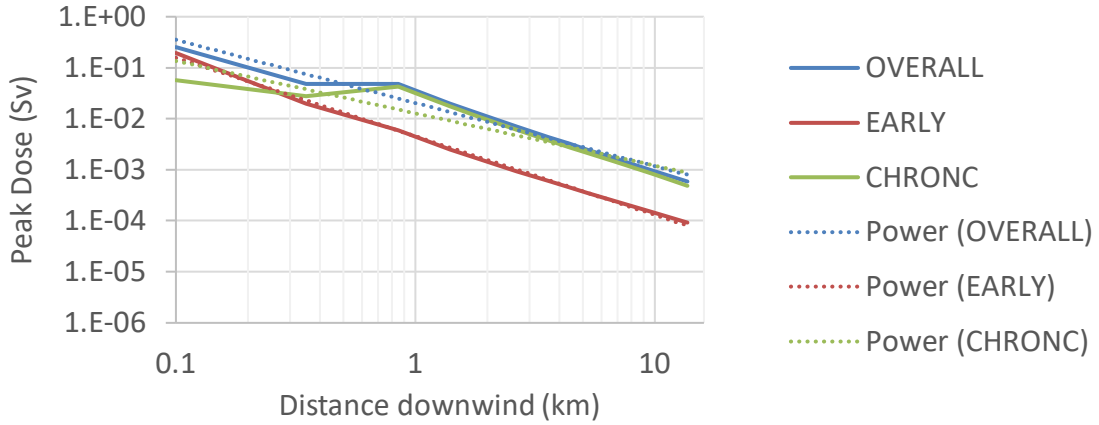
Case 4: Protective Actions

Peak Dose vs Distance

Stability Class A:
Extremely Unstable



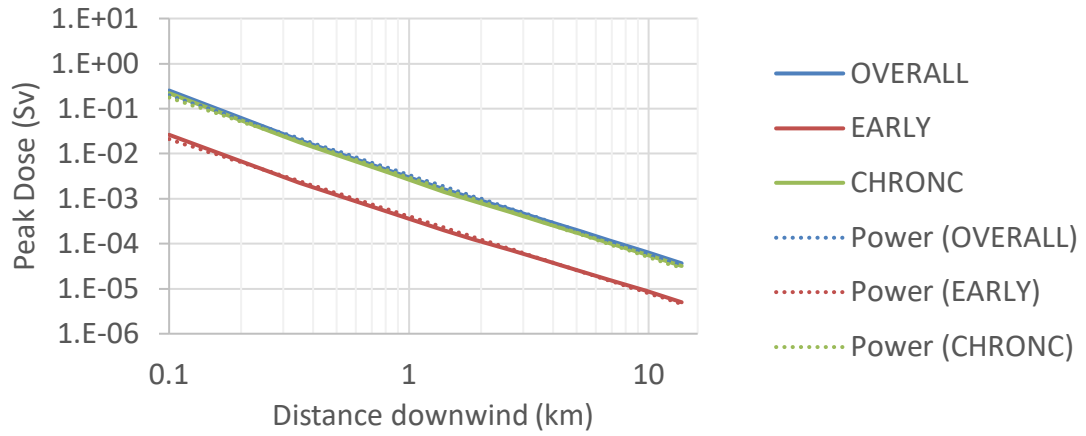
Stability Class F:
Strongly Stable



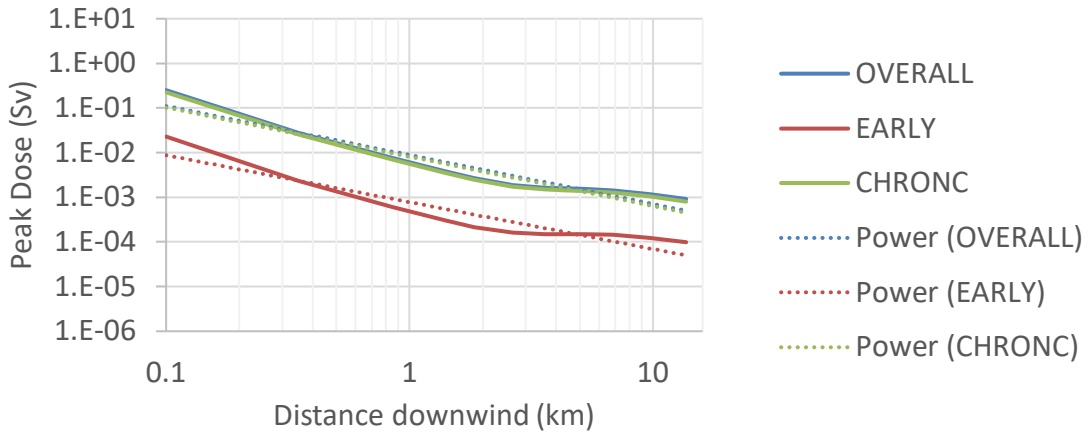
Case 5: Meteorological Sampling

Peak Dose (Mean) vs Distance

Without plume buoyancy

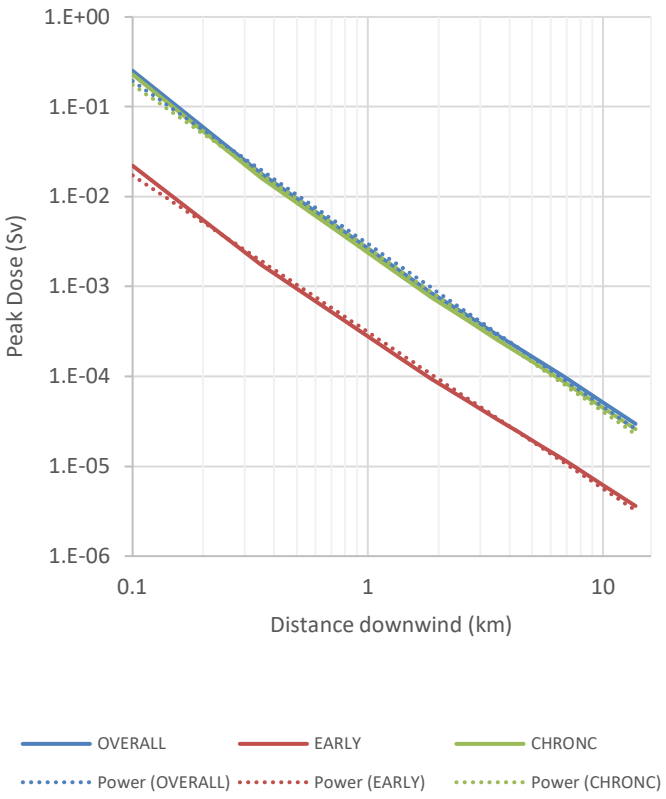


With plume buoyancy

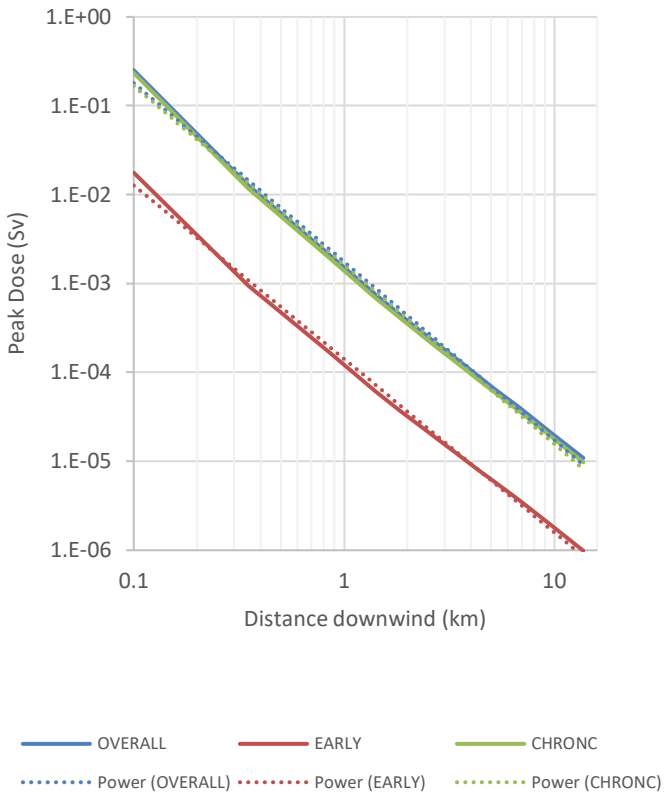


Case 6/7: Weather Sampling with Multiple Plumes

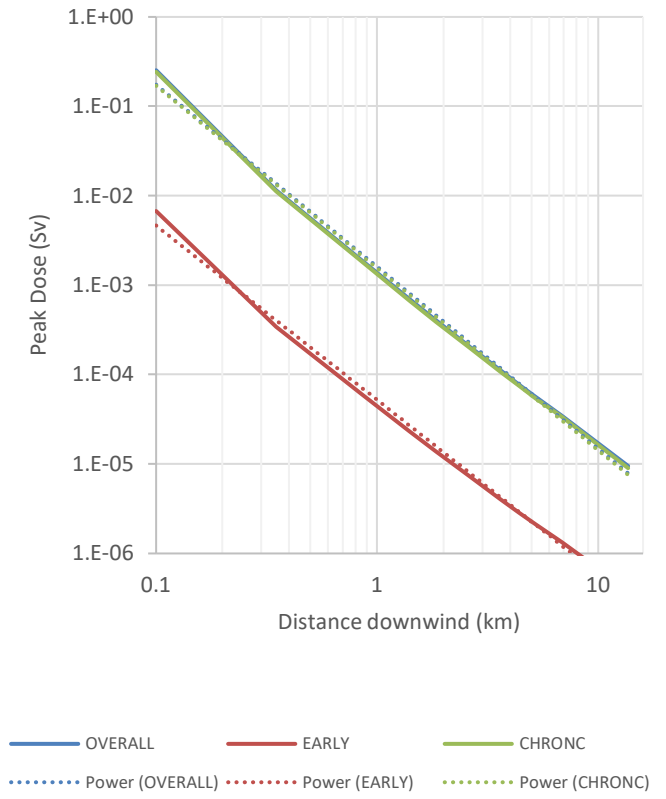
Peak Dose (Mean) vs Distance



VF/5D



LCF/1A2



NOCF/2R1

DG-1413 (proposed new RG 1.254) Technology-Inclusive Identification of Licensing Events for Commercial Nuclear Plants

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Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission

Technology-Inclusive Identification of Licensing Events for Commercial Nuclear Plants (DG-1413)

- Section A: Applies to LWRs and non-LWRs licensed under Parts 50, 52, and 53 (Frameworks A and B)
- Section B (Discussion):
  - Identifies licensing events for each licensing framework
  - Provides historical perspectives (early licensing, development of the standard review plan [SRP])
  - Addresses ACRS recommendations to “start with a blank sheet of paper” (10/7/2019, 10/21/2020, 5/30/2021, and 10/26/2021)
- Section C (Staff Guidance) provides an integrated approach for:
  - Conducting a systematic and comprehensive search for initiating events
  - Delineating a systematic and comprehensive sets of event sequences
  - Grouping the lists of initiating events and event sequences into licensing events
- Appendix A (Comprehensive Search for Initiating Events):
  - Reviews techniques for searching for initiating events and points the user to helpful references
  - Does not endorse or recommend any specific technique

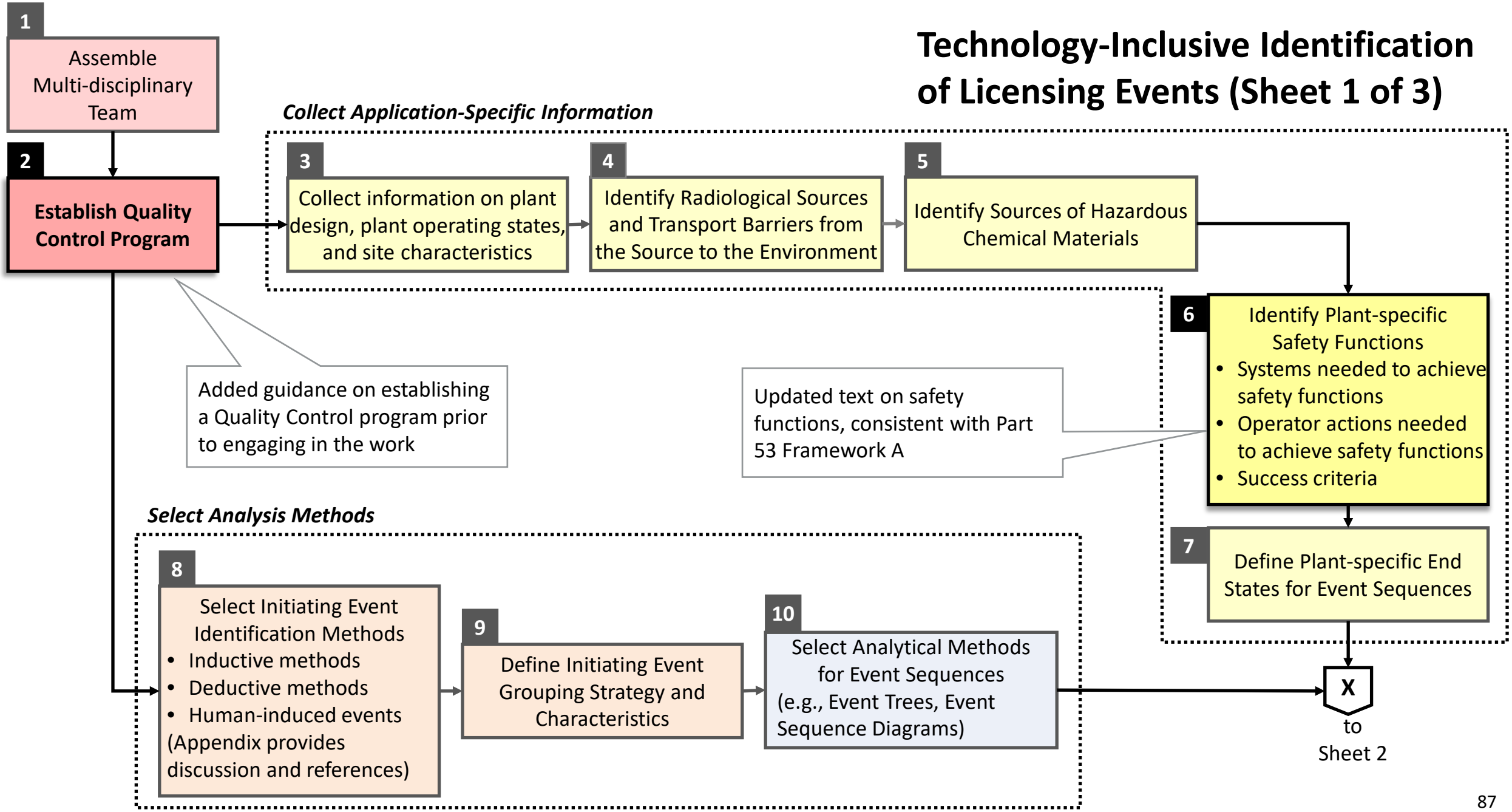
Licensing Pathways and Licensing Events

Regulation and Application Type	Reactor Type	Use of LMP	Licensing Event Categories	Risk Evaluation
Part 50 CP, OL	LWR	not applicable (NEI 18-04, Rev. 1 and RG 1.233 currently only apply to non-LWRs licensed under Parts 50 or 52)	• Design-basis events (DBEs) (§ 50.49): o AOOs o DBAs (i.e., postulated accidents) o External events o Natural phenomena • Non-DBA (§ 50.2 alternate ac source) • Beyond-design-basis events (BDBE) • Anticipated transient without scram • Station black out	not required (Parts 50/52 lessons-learned rulemaking)
Part 52 DC, SDA, ML, COL				PRA required
Part 50 CP, OL	Non-LWR	no		not required (Parts 50/52 lessons-learned rulemaking)
Part 52 DC, SDA, ML, COL				PRA required
Part 50 CP, OL	Non-LWR	yes	Licensing events are collectively referred to as licensing-basis events (LBEs), which include the following categories: • AOOs • DBEs • BDBEs • DBAs	PRA implied by use of LMP
Part 52 DC, SDA, ML, COL				PRA required
Part 53, Framework A CP, OL, DC, SDA, ML, COL	LWR or non-LWR	not applicable (potential future update to NEI 18-04 and RG 1.233)	Licensing events are collectively referred to as LBEs, which include the following categories: • AOOs • Unlikely event sequences • Very unlikely event sequences • DBAs	PRA required
Part 53, Framework B CP, OL, DC, SDA, ML, COL	LWR or non-LWR	not applicable	• AOOs • DBAs • Additional licensing-basis events • Severe accidents	PRA or AERI required

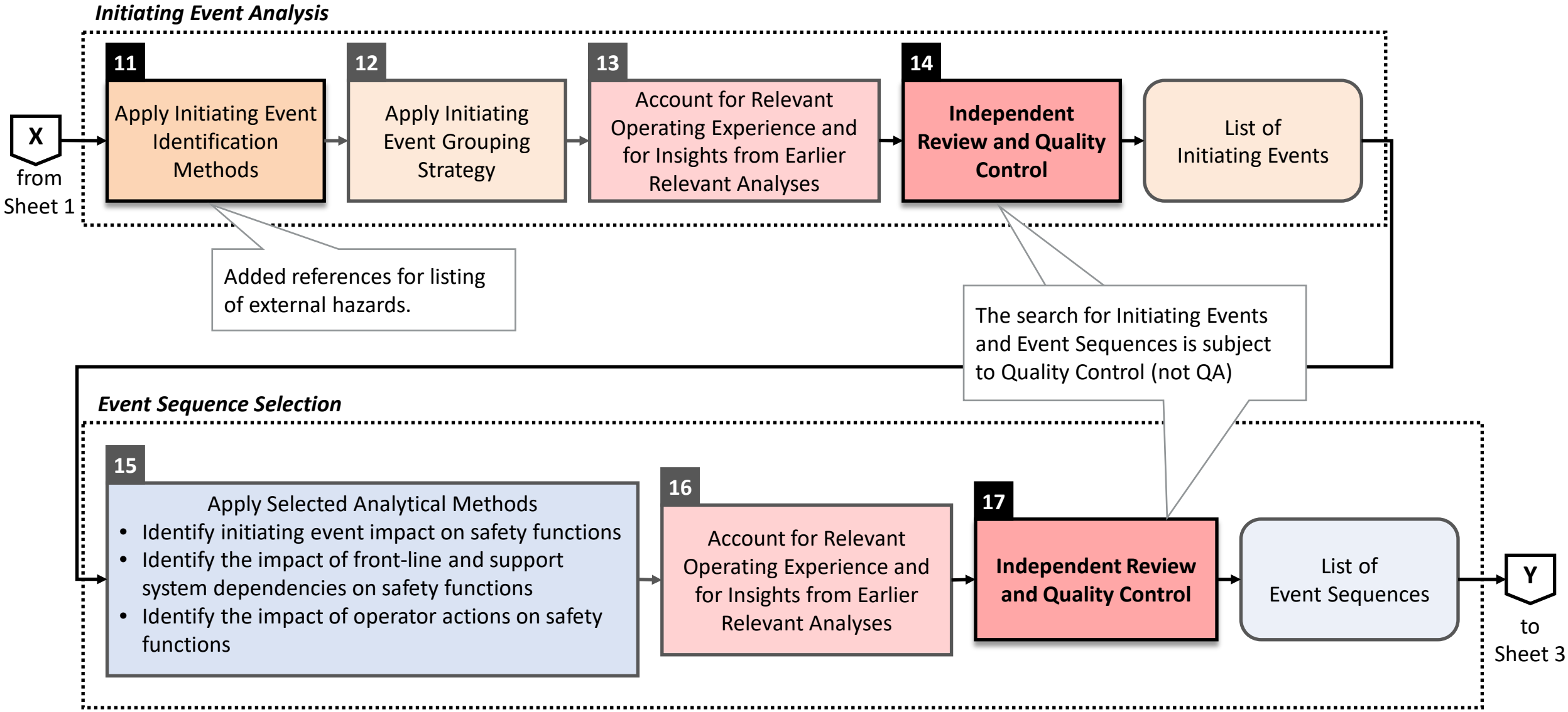
Overarching Principles

- Identify application-specific factors (licensing framework, plant-specific design features, and site characteristics).
- Conduct a systematic and comprehensive search for initiating events.
- Use a systematic process to delineate a comprehensive set of event sequences.
- Group initiating events and event sequences into designated licensing event categories according to the selected licensing framework.
- Provide assurance that the set of licensing events is sufficient.

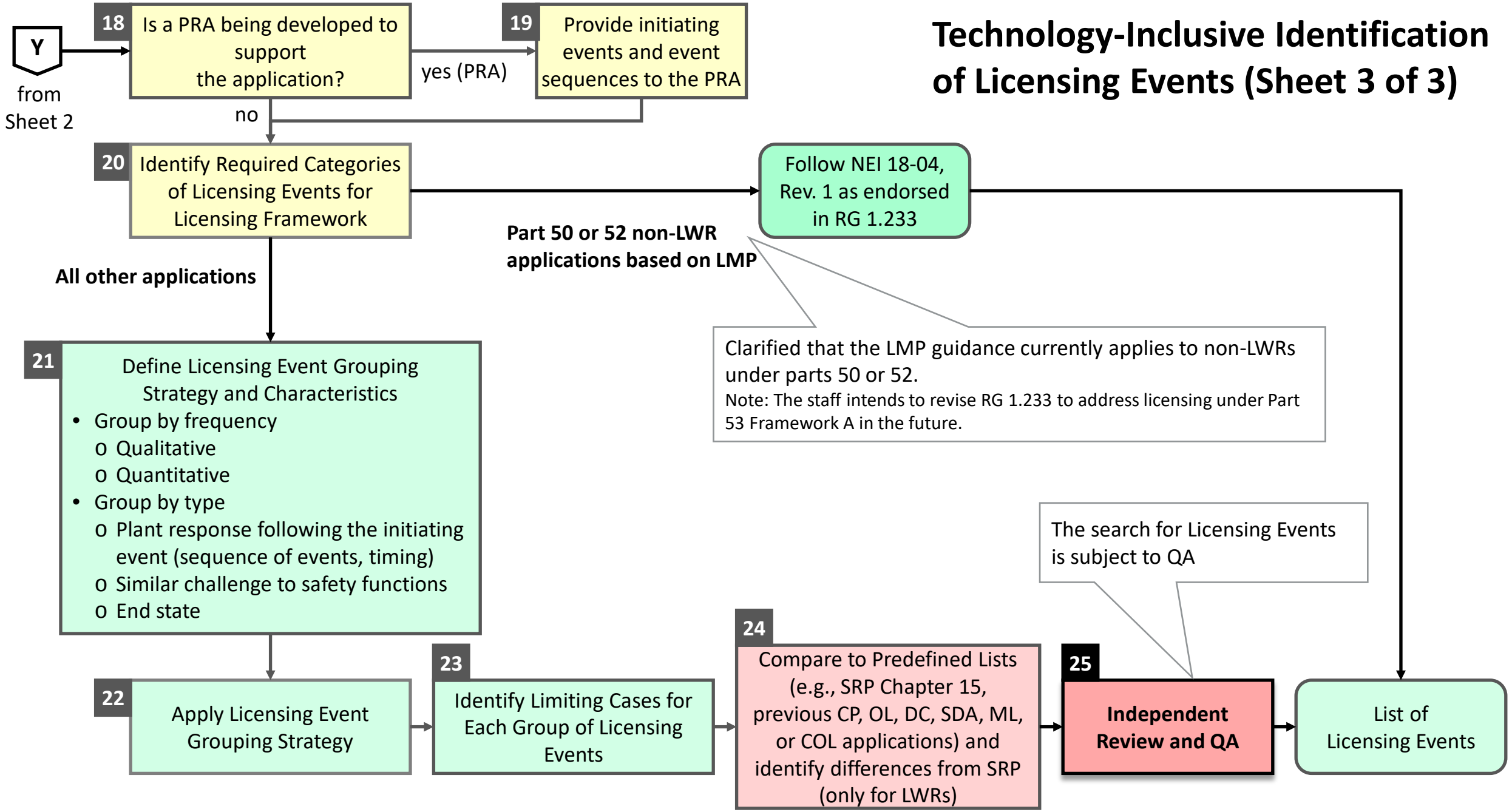
Technology-Inclusive Identification of Licensing Events (Sheet 1 of 3)



Technology-Inclusive Identification of Licensing Events (Sheet 2 of 3)



Technology-Inclusive Identification of Licensing Events (Sheet 3 of 3)



Quality Control Program

- A Quality Control Program should be established prior to engaging in the work; includes personnel, procedures, documentation.
- The initiating event and event sequence analyses are not subject to QA requirements (PRA is not part of the design-basis information).
- Existing programs may be leveraged:
  - If a PRA is developed, PRA Configuration Control can be used for analysis documentation.
  - If a PRA is developed, PRA peer review can be used for independent review.

The licensing event selection informs the design basis and licensing basis; therefore, it is subject to QA requirements.

DG-1414
(proposed new RG 1.255)
Alternative Evaluation for Risk Insights Methodology

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Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission

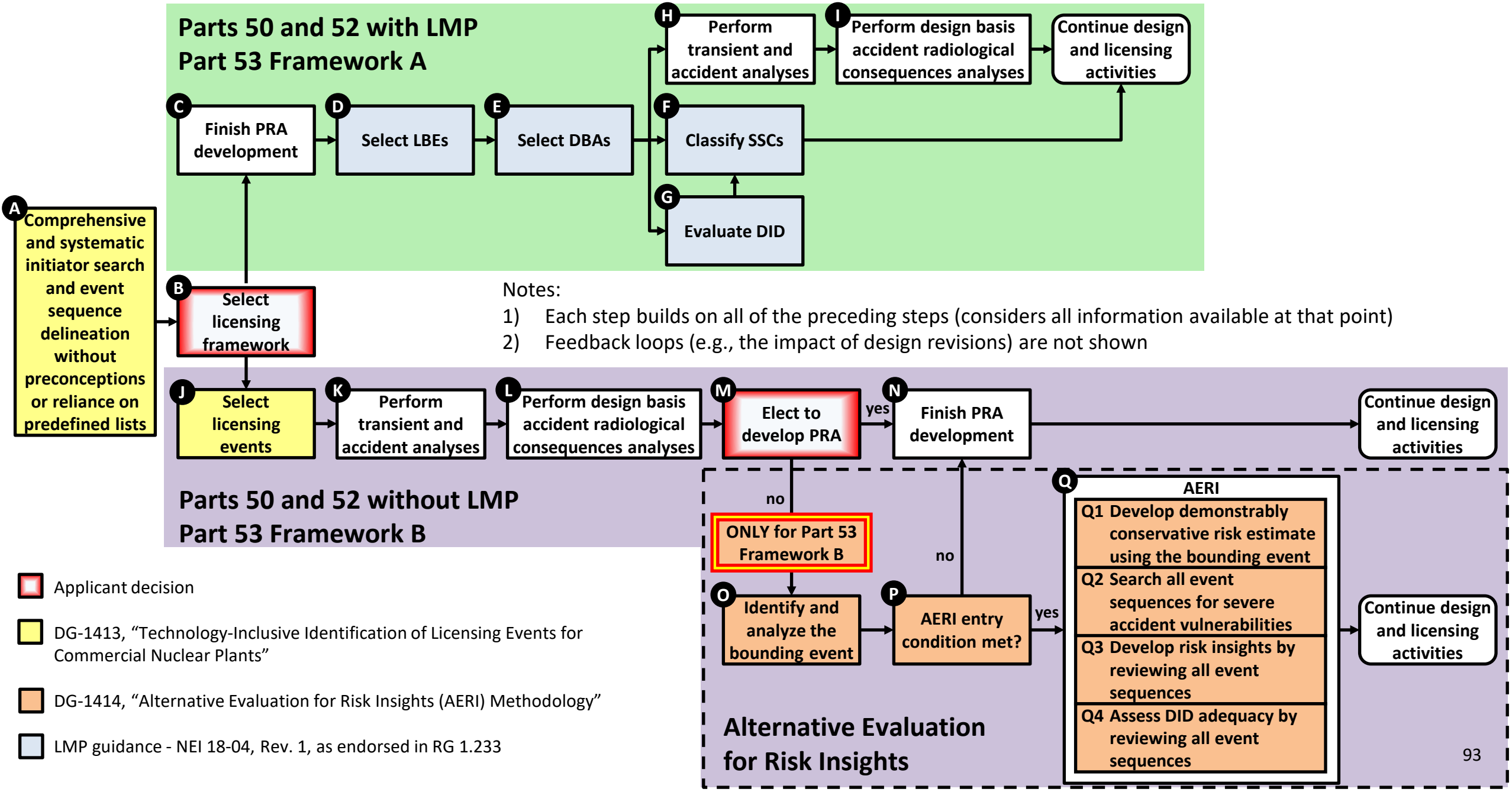
Alternative Evaluation for Risk Insights Methodology

- This RG provides the NRC staff's guidance on the use of an AERI methodology to inform the content of applications and licensing basis for LWRs and non-LWRs.
- 10 CFR 53.4730(a)(34)(ii) establishes AERI as an alternative to a PRA for a risk evaluation if the entry conditions A and B for an AERI are met.
- The title of this DG-1414 is now "AERI Methodology," to distinguish it from Part 53 Frameworks A and B. This new title does not signal any change in approach.

Applicants who meet the AERI entry conditions may elect to develop an AERI in lieu of a PRA. However, PRA confers additional benefits such as:

- A means to optimize the design, and
- The ability to take advantage of various risk-informed initiatives, for example risk-informed completion times, risk-informed categorization of SSCs.

Licensing Pathways – Risk Evaluation Perspective



Notes:

1) Each step builds on all of the preceding steps (considers all information available at that point)
2) Feedback loops (e.g., the impact of design revisions) are not shown

- Applicant decision
- DG-1413, "Technology-Inclusive Identification of Licensing Events for Commercial Nuclear Plants"
- DG-1414, "Alternative Evaluation for Risk Insights (AERI) Methodology"
- LMP guidance - NEI 18-04, Rev. 1, as endorsed in RG 1.233

Elements of the AERI Methodology (1 of 4)

- DG-1414 applies only to LWRs and non-LWRs licensed under Part 53, Framework B
- Identification and characterization of the postulated bounding event(s):
  - Selection of licensing events is covered in DG-1413
  - Consider both core and non-core radiological sources
  - Perform consequence analysis for selected licensing event(s)
  - Multiple bounding events could be considered for events with approximately similar likelihoods of occurrence and similar overall radiological impacts, but with different radiological release characteristics
- Estimate dose consequence for the postulated bounding event to confirm that the reactor design meets the AERI entry conditions:
  - Condition A - Consequences evaluated at 100m (328 feet) from plant do not exceed:
    - 10 mSv (1 rem) TEDE over the first four days following a release,
    - An additional 20 mSv (2 rem) TEDE in the first year, and
    - 5 mSv (0.5 rem) TEDE in second and subsequent years
  - Condition B – Condition A must be met without reliance on active safety features or passive safety features, except passive safety features that:
    - Do not require equipment actuation or operator action to perform their required safety functions,
    - Are expected to survive accident conditions, and
    - Cannot be made unavailable or otherwise defeated by credible human errors of commission and omission
  - One acceptable approach to developing a dose consequence estimate is to provide the postulated bounding event source term to MACCS or a comparable analytical model

Elements of the AERI Methodology (2 of 4)

- Determination of a demonstrably conservative risk estimate for the postulated bounding event to demonstrate that the QHOs are met:
  - Utilize consequence estimate.
  - Assume a frequency of 1/yr to represent the sum of the event sequence frequencies (based on LWR statistics equal to the sum of initiating event frequencies).
  - Compare to QHOs.
  - Applicant may use a different frequency, with justification, which NRC staff will review on a case-by case basis.
  - One acceptable approach to developing a dose consequence estimate is to provide the postulated bounding event source term to MACCS, or a comparable analytical model.
  - The applicant should identify the software codes used for the consequence analyses and provide information on how the development and maintenance of these software codes meets quality standards commensurate with the application.

Elements of the AERI Methodology (3 of 4)

- Search for severe accident vulnerabilities:
  - Severe accidents are those events that progress beyond the DBAs, in which substantial damage is done to the reactor core or to any other structure, vessel, or retention system containing a significant inventory of radiological material, whether or not there are serious offsite consequences
  - Severe accident vulnerabilities are aspects of a design which represent an overreliance on a single design feature, either for accident prevention or mitigation, that could lead to a severe accident
  - Encompasses the entire set of licensing events and any additional severe accidents
  - Search for cliff-edge effects
  - Consider external hazards
- Address how identifying severe accident vulnerabilities could enable the design to prevent or mitigate severe accidents
- Justify why a severe accident vulnerability is acceptable for the design

Elements of the AERI Methodology (4 of 4)

- Identification of risk insights:
  - The objective of the search for risk insights is to understand issues that are important to plant operation and safety such as:
    - important hazards and initiators
    - important event sequences and their associated SSC failures and human error
    - system interactions
    - vulnerable plant areas
    - likely outcomes
    - sensitivities
    - areas of uncertainty
  - Search encompasses the entire set of licensing events
  - Provides an understanding of the hierarchy of event sequences ranked by frequency
- Assessment of DID adequacy:
  - Encompasses the entire set of previously identified licensing events
  - Facility design should include a reasonable balance among the layers of defense, to ensure that failure of a single barrier does not result in a severe accident

Maintaining and Upgrading the AERI Risk Evaluation (1 of 2)

- Assure that the AERI risk evaluation continues to be valid, useful, and an adequate basis for regulatory decision-making throughout the plant operating lifetime.
  - The initial risk evaluation must be performed by the scheduled fuel load date
  - The risk evaluation should be maintained/upgraded every five years
- Regularly assess that the “postulated bounding event” selection remains current
  - If not, identify new postulated bounding event to be used in the upgraded risk evaluation
- As-built, as-operated facility
  - Ascertain if any important aspects of the facility’s design or operational scheme have changed since the prior risk evaluation, and if so, maintain/upgrade the risk evaluation
- New safety issue(s)
  - Ascertain if any new safety issues have arisen since the prior risk evaluation, and if so, maintain/upgrade the risk evaluation
- New data, information, or analyses
  - Ascertain if any relevant new data, information or analyses have arisen since the prior risk evaluation, and if so, maintain/upgrade the risk evaluation

Maintaining and Upgrading the AERI Risk Evaluation (2 of 2)

- QHO comparison
  - If the AERI risk evaluation requires upgrading, the QHO comparison should be revisited and modified, if appropriate
- Vulnerability search
  - If the AERI risk evaluation requires upgrading, the severe accident vulnerability search should be revisited and modified, if appropriate
- Search for Risk Insights
  - If the AERI risk evaluation requires upgrading, the search for risk insights should be revisited and modified, if appropriate
- DID
  - If the AERI risk evaluation requires upgrading, the DID evaluation should be revisited and modified, if appropriate

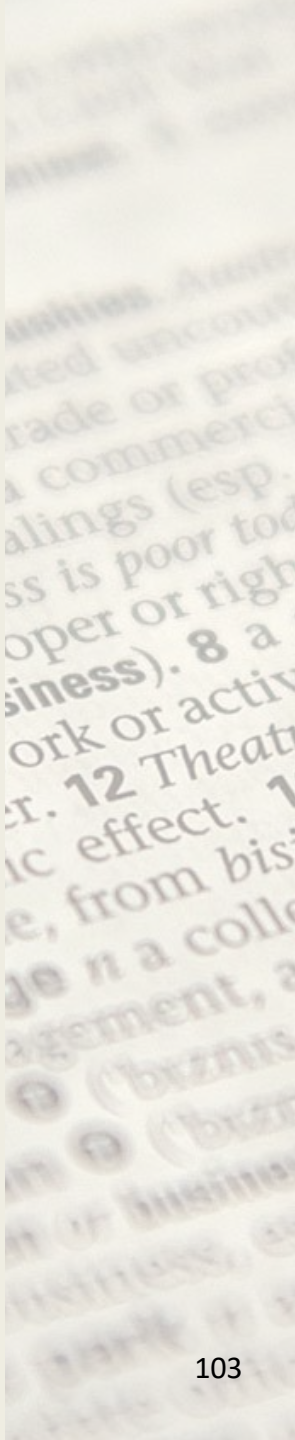
Discussion

Final Discussion and Questions

Agenda – October 19th

8:35 am – 1:00 pm	Requirements for Operations: Draft Proposed Language for Staffing, Role of STA, and Guidance
1:00 pm – 2:00 pm	Lunch
2:00 pm – 5:00 pm	Draft Proposed Language Addressing Other ACRS Comments and Major Industry Comments

Preliminary Requirements for Operations: Rule Language Updates, Staffing Topics, and Overview of Key Guidance



Agenda

- Introduction
- Updates to Subparts F and P since the 2nd Iteration
  - Consolidation of requirements under Subpart F
  - Current status of engineering expertise requirements
  - Current status of GLRO requirements
  - Response to recent ACRS letter
- Overview of ISG for Operator Licensing Program Reviews
- Overview of ISG for Staffing Plan Reviews
- Overview of ISG for Scalable Human Factors Engineering (HFE) Reviews
- Questions

Overview of Primary Staff Contributors (NRR & RES)

- Theresa Buchanan, Senior Reactor Engineer (Examiner)
- Dr. David Desaulniers, Senior Technical Advisor for Human Factors and Human Performance Evaluation
- Dr. Brian Green, Senior Human Factors Engineer (Team Lead)
- Dr. Niav Hughes Green, Human Factors Psychologist
- Dr. Stephanie Morrow, Human Factors Psychologist
- Lauren Nist, Branch Chief, Operator Licensing and Human Factors Branch
- Maurin Scheetz, Reactor Engineer (Examiner)
- Jesse Seymour, Senior Reactor Engineer (Examiner)

Updates to Subpart F and P since the 2nd Iteration

- Requirements for HFE, staffing, operator licensing, and training have all been consolidated under Subpart F, with Subpart P now just containing a single pointer located at 53.4220 (i.e., Framework A and B now use a common set of requirements in these areas)
- The class of reactors meeting the technical requirements for utilizing GLROs has been defined as “self-reliant mitigation facilities”
- Procedure program requirements have been consolidated
- Staffing plan requirements for non-operations positions are now functional in nature
- Examination programs are required to provide for validity and reliability in testing
- Remedial training is mandated for operators failing requalification examinations
- Commission approval is no longer required for simulation facilities

Status of Engineering Expertise & GLRO requirements

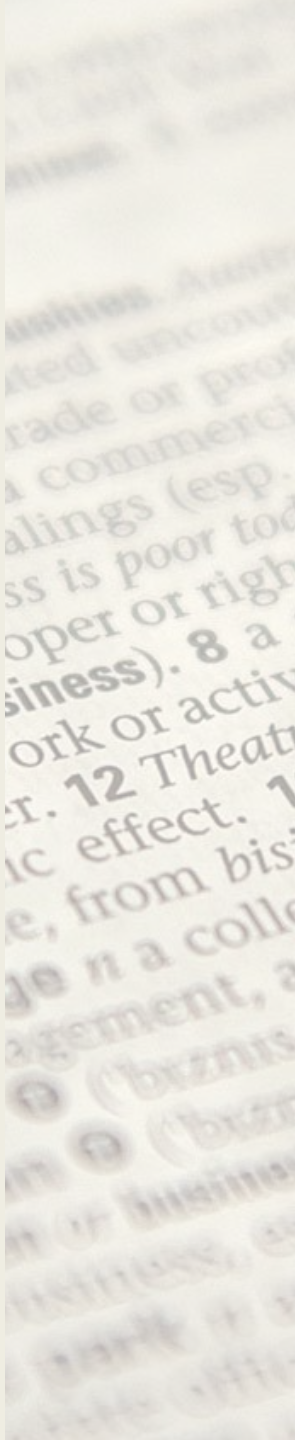
- Engineering expertise remains a required element of staffing plans for all facilities under both Frameworks A and B, including for those facilities staffed by GLROs
- Criteria for potentially allowing facilities under Framework B to use GLROs have been incorporated, in addition to those already in place for Framework A
  - Framework B GLRO criteria vary depending on whether an AERI is used
  - Irrespective of AERI, DID without human action is needed
  - For a non-AERI plant, the GLRO criteria are analogous to the equivalent criteria for Framework A, as adapted to the differing requirements of Framework B
  - For an AERI plant, the GLRO criteria are met by meeting AERI criteria (plus DID)
- These various sets of criteria have a common goal of identifying when operators are not expected to significantly influence safety outcomes based on the design
- GLRO criteria now are specific to limiting analysis to “credited” human actions

Response to Interim Letter Report from August 2022

- ACRS letter included a recommendation that "…the associated guidance for implementing 10 CFR Part 55 can be amended to accommodate the objectives of the proposed rule without the additional voluminous text."
- Key points form the staff response included the following:
  - New framework for operator licensing under Part 53 is technology-inclusive and creates significant flexibilities compared to Part 55
  - Accommodating such flexibilities while complying with statutory requirements necessitates requirements for GLROs being codified in regulations
  - Absent Part 53's alternative, applicants would be required to adhere to Part 55
  - While revised or new guidance could be developed, applicants would be required to seek exemptions and justify pursuing alternative approaches, requiring NRC staff reviews on an application-specific basis; proposed Part 53 will remove the need for exemptions and enhance regulatory reliability and clarity

Overview of ISG for Operator Licensing Program Reviews

DRO-ISG-2023-01
Operator Licensing Programs
Draft Interim Staff Guidance



Purpose

- To assist staff reviews of applications under 10 CFR Part 53 related to the operator licensing examination program
- To provide guidance for review of tailored initial and requalification examination programs
  - For specifically licensed operators (SROs and ROs)
  - For generally licensed operators (GLROs)
- To address proficiency for SROs and ROs
- To assist staff reviews of exemptions from 10 CFR Part 55 for non-LWR, power reactor examination programs

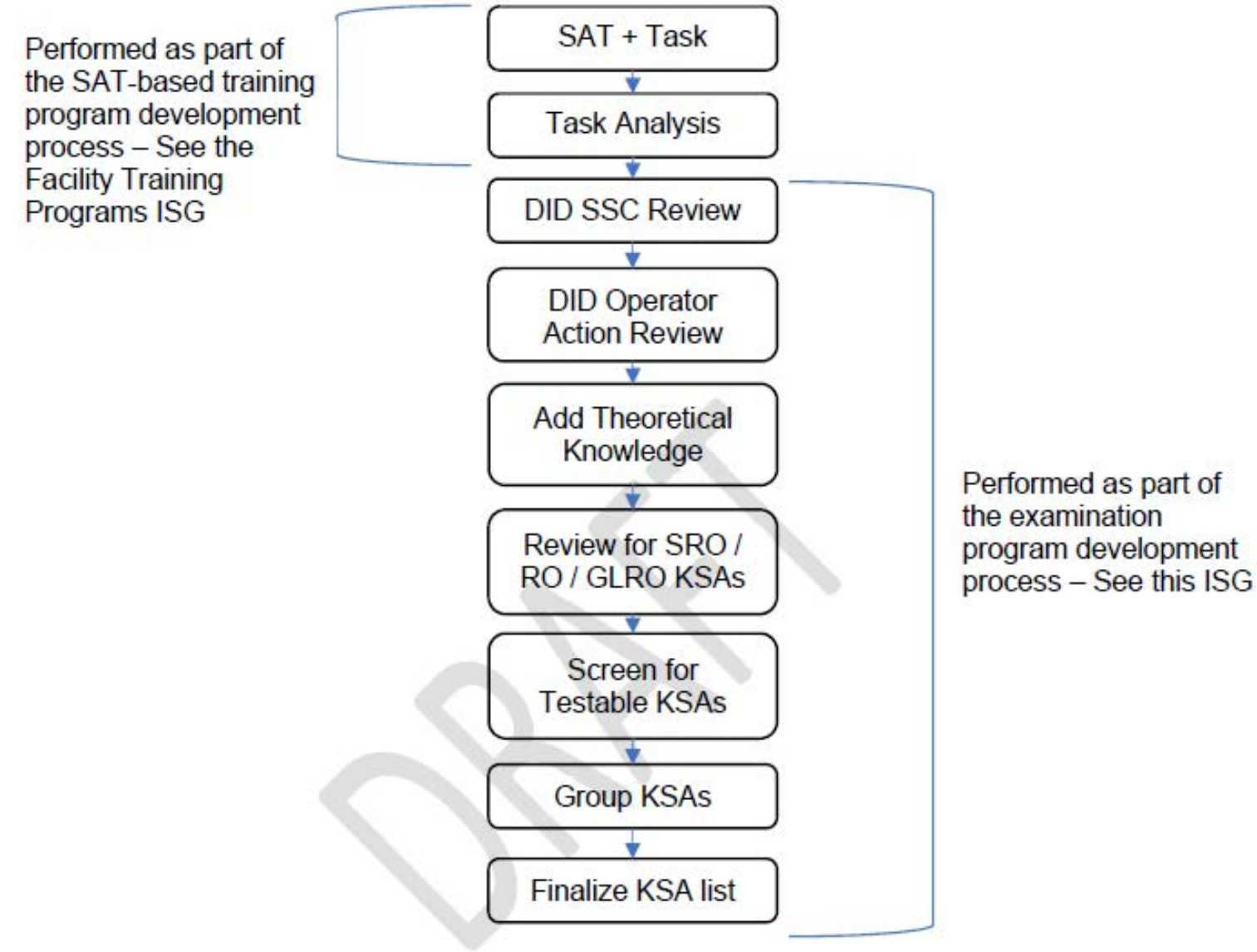
Goals

- Enable facility applicants/licensees to identify knowledge, skills, and abilities (KSAs) necessary for safe operation as the basis for the examination standards
- Establish reliable guidelines for exam program developments based on current best practices from research and expertise on the measurement and testing of KSAs

Section 1.0 KSAs List Development

- Systems approach to training-based processes are used to identify a training KSA list
  - This list is not solely limited to tasks related to safe plant operation
  - DRO-ISG-2023-04, “Facility Training Programs,” is planned to provide additional information in this area
- Using this list as a starting point, a screening is performed to identify those tasks important to safe plant operation and/or related to the foundational theory of plant operations to develop the KSA list for the exam program
  - Depending on the original list, may have needed to add or remove items to get the necessary KSAs for testing

Figure 1.0 – Overview of KSA Development Process Steps



Section 2.0 Operator Licensing Test Development

- Developed Test Plan
  - How the testable KSAs will be measured
  - For example, what KSAs will be tested using a written test, or a walkthrough format, etc.
  - What the format for the test will be
- Developed detailed content specification
  - What specific KSAs the exam type (written, oral, scenario, job performance measure, etc.) covers
  - How the KSAs are sampled for each examination developed
  - How the test items are reviewed for clarity, quality, and other psychometric issues

Section 3.0 Examination Validity

- Describe validation plan
  - What evidence was collected to support validity of the test, that the test works and will work as intended
    - Content validity, concurrent validity
    - Should require content validity at the least

Section 4.0 Scoring Specifications

- Criterion-referenced
  - Described how each test item is scored and how scores combined to get total score
  - If based on scorer observation, described steps to eliminate any bias in judgments
  - Provided cut-off score

Section 5.0 Reliability of the Test

- If individual repeats the test, the result would be similar to the original result
- Documentation that the tests will have stability of test performance over time
- Documentation of findings that are adequate to justify use of the test for operator licensing

Section 6.0 Test Manual

- Companion to the test plan
- Provides more detail related to the specific types of tests
- Includes administrative aspects of test
  - How to administer
  - Time to administer or time allowed to take the test
  - Materials provided to test takers
  - How to interpret test results

Section 7.0 Additional Characteristics of High-Quality Test Materials

- This section is specifically for written and computer-based tests
- Provides additional characteristics associated with psychometrics, test instructions, objective scoring system, and standardization

Section 8.0 Other Examination Program Considerations

- This section references back to sections of NUREG-1021, “Operator Licensing Examination Standards for Power Reactors” for items that are universally applicable, regardless of plant design

Section 9.0 Simulation Facilities

- Documentation on how the simulation facility provides a level of fidelity sufficient to assess KSAs as required by 10 CFR Part 53.780(e) or 53.815(e)
- Simulation facilities should have same cognitive requirements as the real environment
- For simulation-based assessment, documentation provided on how that examination is valid

Section 10.0 Administering Operating Tests

- Examination procedures should be similar to those in NUREG-1021, as specific to the type of test administered
- Measures are in place to ensure examiners behave in accordance with codes of conduct to ensure examination integrity
- Measures are in place to retain required records

Section 11.0 Examination Program Change Management Process

- Documentation specifies what changes require NRC approval and which do not
  - NRC approval
    - Exemption from regulation
    - Change to technical specification
    - Negative impact to examination security/integrity
    - Negative impact on consistency

Section 12.0 Static Computer-Based Testing

- Beyond the scope of the guidance
- The documentation would need to describe how this approach is equivalent to the guidance provided in the ISG

Section 13.0 Additional Guidance for Requalification Programs

- Any requalification failures must be remediated and retested prior to returning to license duties
- For ROs and SROs
  - Periodicity not to exceed 24 months
- For GLROs
  - Periodicity defined by program
  - If >24 months, bases provided

Section 14.0 Proficiency Programs for Specifically Licensed Operators and Senior Operators

- Actively perform the functions
- Maintain proficiency and familiarity
- Re-establish proficiency if it cannot be maintained

Section 15.0 Waivers for GLROs

- Appropriate criteria to waive requirements for an examination included in the program
- If similar to 10 CFR 55.47, no further NRC review
- Else, a basis is provided that describes how the criteria ensures individuals are able to safely and competently operate the facility

Appendix A Currently Approved Examination Methods

- Methods currently approved in NUREG-1021 can be used without needing further basis from the facility or additional NRC review
- Example: use of a 4-part multiple choice written examination with 80% cut score

Overview of ISG for Staffing Plan Reviews

DRO-ISG-2023-02
Interim Staff Guidance Augmenting NUREG-1791, "Guidance for Assessing Exemption Requests from the Nuclear Power Plant Licensed Operator Staffing Requirements Specified in 10 CFR 50.54(m)," for Licensing Plants under Part 53

Background: Current Practice

- Current 10 CFR 50/52 staffing requirement (i.e., 50.54(m)) is prescriptive
- NRC reviews exemptions to this requirement using NUREG-1791, Guidance for Assessing Exemption Requests from the Nuclear Power Plant Licensed Operator Staffing Requirements Specified in 10 CFR 50.54(m)
  - Developed with advanced reactors in mind
  - Performance-based process for determining appropriate number of licensed control room operators
  - 11 steps including a staffing plan validation
- Staff used NUREG-1791 to evaluate novel control room staffing models for NuScale SMR design and concept of operations
- Cannot use NUREG-1791 as written for Part 53 staffing plan reviews because it relies on exemptions to Part 50 requirements

Part 53 Approach to Staffing

- Applicant proposes minimum staffing level by submitting a staffing plan with application
- Consider differences in staffing level when operators have/do not have a safety role (i.e., for specific or generally licensed operators) – if specific licenses then applicants must include more detail supported by HFE analysis and assessments
- Operators may fill multiple roles (e.g., maintenance, radiation protection, etc.) so must include these responsibilities in staffing plan submittal
- The staff will review and approve the staffing plan. Changes to approved staffing plans are subject to administrative controls

Preliminary Part 53 Staffing Requirement

- Addressed under the preliminary requirements of § 53.730(f):
  - *A staffing plan must be developed to include the numbers, positions, and qualifications of operators and senior operators or, if applicable, generally licensed reactor operators across all modes of plant operations, as well as a description of how the numbers, positions, and responsibilities of personnel contained within those plans will adequately support all necessary functions within areas such as plant operations, equipment surveillance and maintenance, radiological protection, chemistry control, fire brigades, engineering, security, and emergency response.*

Proposed Part 53 Requirement for On-Shift Engineering Expertise [§ 53.730(f)(1)]

- The staffing plan must include a description of how engineering expertise will be available to the on-shift crew during all plant conditions to assist in situations not covered by procedures or training
- A person available to support the crew at all times. This person is familiar with the operation of the facility and has a technical degree:
  - Bachelor's in in engineering or,
  - Bachelor's in engineering technology or a physical science or,
  - PE license
- Basis: Commission policy for, "Education for Senior Reactor Operators and Shift Supervisors at Nuclear Power Plants," (published in the Federal Register (54 FR 33639) on August 15, 1989)

DRO-ISG-2023-02: for review of Part 53 staffing plans

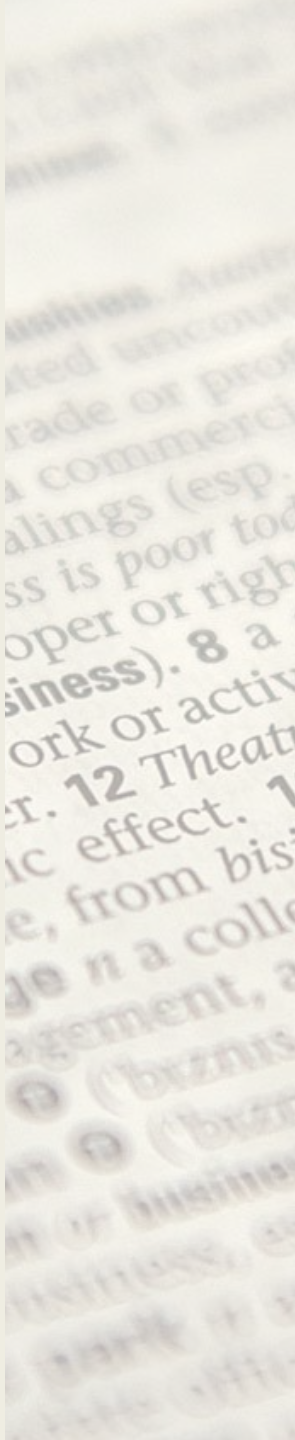
- Objective is to guide reviewer through the process of:
  - Evaluating staffing plans and support analyses submitted under § 53.730(f)
  - Determining whether the proposed minimum staffing level provides assurance that plant safety functions can be maintained across all modes of plant operations
  - Approving staffing plans
- For plants that will have specifically licensed operators; could scale the review for plants with generally licensed operators
- Use in conjunction with NUREG-1791
- 11 steps that rely on other Human Factors elements
- Includes review guidance for engineering expertise requirement
- Developed as an Interim Staff Guide (ISG)
  - Following experience with using the ISG the staff plans to update NUREG-1791

DRO-ISG-2023-02: for reviewing engineering expertise

- Guidance on what staff will look at for satisfying engineering expertise requirement to include:
  - Education prerequisites
  - Training and qualification
  - Responsibilities of the job
  - Data needs if offsite
  - Response time if on site
  - Expectations for one or multiple people filling the job
  - Communication needs
  - Cybersecurity expectations
  - Include job in validation activities

Overview of ISG for Scalable Human Factors Engineering Reviews

DRO-ISG-2023-03
Development of Scalable Human Factors Engineering Review Plans



Background: Current Practice

- Current 10 CFR 50 HFE requirement (i.e., 50.34(f)(2)(iii)) is focused on the main control room
- NRC's HFE reviews for large light-water reactors have been conducted using NUREG-0711, Human Factors Engineering Program Review Model
  - Systems engineering based approach
  - 12 program elements and 300+ criteria
- Lessons-learnt from recent Part 52 reviews indicated a need for a new approach to regulation and review of HFE for advanced reactor technologies

Background: Proposed Part 53 Approach to HFE

- HFE to be required where necessary to support important human actions
- HFE reviews to be application specific (i.e., scaled) considering the characteristics of the facility design and its operation

Background: Preliminary Part 53 HFE Requirement

- Addressed by the preliminary requirement of § 53.730(a)
- The plant design must reflect state-of-the-art human factors principles for safe and reliable performance in all locations that human activities are expected for performing or supporting the continued availability of plant safety or emergency response functions

Background: Draft Guidance

- Objective is to guide reviewer through the process of:
  - Developing an application specific review plan
  - Identifying appropriate HFE review guidance
- To be used in place of NUREG-0800, Chapter 18, Human Factors Engineering
- Developed as an ISG
  - Following experience with using the ISG the staff plans to make the guidance a NUREG

Scaling Process: Overview

- Begins - during pre-application engagements (if conducted)
- Concludes - with completion of application acceptance review
- Conducted - in 5 steps leading to the staff assembling the review plan

Scaling Process: 5 Steps

1. **Characterization** – establishing a documented understanding of the design and its operation from an HFE perspective
2. **Targeting** – identifying aspects of the design and operation for HFE review
3. **Screening** – selecting HFE program elements / activities for review in conjunction with each target
4. **Grading** – selecting specific standards and guidance documents to be applied to the review
5. **Assembling the review plan** – integrating results of prior steps to produce a plan that supports an efficient, risk-informed, reasonable assurance determination

Scaling Guidance: Overview

- Main body (22 pages) – provides essential guidance for developing the review plan
- Appendices (88 pages) – provide supporting guidance for implementing each step of the process

Scaling Guidance: Main Body – Key Features

- Applicability:
  - SDAs, DCs, COLs and OLs
- Rationale for scaling reviews
- Regulatory basis / acceptance criteria
- Guidance for each step of scaling process
  - Objective
  - Process
  - Reviewer Responsibilities
- Focus is on “what to do / accomplish” when scaling reviews

Scaling Guidance: Appendices – Key Features

- Focus is on “how to”
- Recommended methods for each step of scaling process
- Pointers to sources of additional guidance

Scaling Guidance: Appendix A

Characterization:

- What to include in the characterization – essential elements
- How to organize and document the characterization
- Use of the characterization to aid coordination with related reviews (e.g., staffing, operator licensing, instrumentation and controls)

Scaling Guidance: Appendix B

Targeting:

- General principles for target selection
- Descriptions of 38 prospective (example) characteristics of advanced reactor designs and operations
  - Human performance implications
  - Availability of guidance to support reviews

Scaling Guidance: Appendix C

Screening:

- General strategies and specific considerations for selecting which HFE activities to review or screen out
- Implications / challenges of advanced reactor design characteristics for certain HFE activities or their review

Scaling Guidance: Appendix D

Grading:

- Guidance for selection of standards and guidance documents to support the review
  - Considerations for use of documents that lack prior NRC endorsement
- Reference table of HFE standards and guidance documents in both nuclear and non-nuclear domains

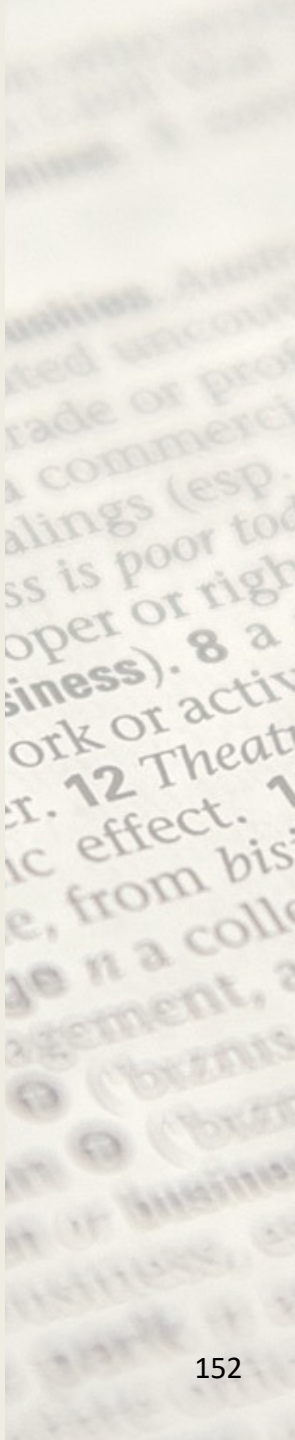
Scaling Guidance: Appendix E

Assembling the Review Plan:

- Strategies for integrating the results of Steps A-D to develop a plan that is efficient yet sufficient to support a reasonable assurance determination
- Guidance for documenting the review plan and gaining management approval

Discussion

Draft Proposed Language Addressing Other ACRS Comments and Major Industry Comments



Interim Letter Report; October 21, 2020	
1. The staff's proposed approach for developing the Title 10 of the Code of Federal Regulations (10 CFR) Part 53 rule is viable.	
2. The staff should ensure that applicants compensate for novel designs with uncertainties due to incompleteness in the knowledge base by performing systematic searches for hazards, initiating events, and accident scenarios with no preconceptions that could limit the creative process.	Concern addressed by requirements in both frameworks requiring systematic assessments to identify events supporting the design and licensing of commercial nuclear plants. Examples include §§ 53.240 and 53.450 in Framework A and § 53.4730 in Framework B. In addition, proposed guidance provided in DG-1413.
3. The rule should provide a pathway for licensing prototype facilities, when uncertainties in the knowledge base and lack of operating experience suggest that additional testing and monitoring are needed.	Existing pathway for prototype facilities maintained in both frameworks. Provisions included in § 53.440 (Subpart A, common), § 53.440 for Framework A, and § 53.4730 for Framework B. Existing guidance on prototype plants is applicable to Part 53.

Interim Letter Report; May 30, 2021	
1. The overall structure of Subparts A through I provides a logical framework for the rule. It is complete with respect to topics that must be covered and addresses the lifetime of a power reactor. It will be helpful to all applicants and to the NRC staff.	
2. A coherent and detailed explanation of the integrated intent of the rule and its associated design-specific guidance should be developed as soon as possible and enshrined in the rule itself.	Included some introduction-type sections to various subparts. However, most detailed explanation of the rule provided in Preamble.

Interim Letter Report; May 30, 2021	
3. Regarding Subpart B: a. To this point in the development, we find no value in the two-tiered approach to safety requirements. Alternative integral risk criteria to the QHOs should be investigated.	(a_1) Revised Subpart B to eliminate reference to two tiers. However, safety objectives include: (1) ensuring no immediate threat to public health and safety and (2) considering potential risks. (a_2) See previous discussion on QHOs.
b. Desired flexibility to address the broad range of technologies … is provided …	(c) Framework A continues to define a top-down methodology based on criteria, safety functions, and related requirements for SSCs, personnel, and programmatic controls. Framework B requires development of principal design criteria based on LWR general design criteria or other generally accepted standards.
c. The rule should include a set of over-arching general principles in one place (Subpart B) that would apply to any reactor concept.	
d. The rule should state that safety analyses must demonstrate that for … AOOs all safety related barriers to release are maintained.	(d) Framework A (§ 53.450(e)) requires establishing evaluation criteria for each AOO [anticipated event sequence]. Framework B ((§ 53.4730(a)(5)(iii)) limits offsite dose for AOOs and requires demonstration that events do not escalate to DBA.
e. The rule should state that safety analyses must demonstrate that DBAs achieve and maintain a safe, stable, and subcritical condition.	(e) Framework A (§ 53.450(f)) revised to require safe, stable end state for DBA and subcriticality following LBE required by § 53.440(g). Framework B (§ 53.4730(a)(5)(ii)) requires acceptance criteria for SR SSCs to demonstrate they adequately mitigate the consequences of DBAs. Additional requirements provided though principal design criteria.

Interim Letter Report; May 30, 2021	
4. Subpart C, “Design and Analysis Requirements,” is generally in good shape. a. The requirement for risk-informed analysis is appropriate if the use of PRA is approached in a graded fashion commensurate with the potential consequences and the simplicity of the design. b. The requirements for selection and analysis of DBAs must be clarified. c. The rule eliminates single failure criteria but needs to define the process that replaces it.	a. Rule language remains general (requiring use of PRA in Framework A) and flexibility afforded through key guidance such as RG 1.247 b. Requirements to identify and assess DBAs provided in §§ 53.240 and 53.450(f) in Framework A and § 53.4730(a)(5)(ii) in Framework B. Each maintains general alignment with Parts 50/52 in terms of establishing design requirements for safety-related SSCs. Additional information available in guidance documents (e.g., RG 1.233 for Framework A) c. Use of probabilistic (reliability) criteria instead of single failure criteria for Framework A discussed in Preamble (see also SECY-03-0047)
5. The two recommendations in our first letter report on 10 CFR Part 53 of October 21, 2020, still apply: for novel designs with uncertainties due to incompleteness in the knowledge base, systematic searches for hazards, initiating events, and accident scenarios should be required; and a licensing pathway including additional testing and monitoring akin to prototype testing should be available.	Concern addressed by requirements in both frameworks requiring systematic assessments to identify events supporting the design and licensing of commercial nuclear plants. Examples include §§ 53.240 and 53.450 in Framework A and § 53.4730 in Framework B. In addition, guidance provided by developing DG-1413. Existing pathway for prototype facilities maintained in both frameworks.

Interim Letter Report; February 17, 2022	
1. The staff is methodically working through the delicate balance of flexibility and predictability in regulations for operator staffing.	.
2. The staff should consider the suggestions identified in this letter to ensure the 10 CFR Part 53 approach yields equivalent safety to current regulatory approaches.	Staff agrees with the ACRS, See subsequent iterations and discussions
3. The staff should approach the concept of not having a Shift Technical Advisor (STA) by having the applicant justify why the STA is not needed rather than a blanket elimination of this position. This is particularly important for the expected wide application of first-of-a-kind technologies that may be licensed under this rule.	See subsequent iterations and discussions
4. The concept of non-licensed, certified operators should not be pursued. Staff should focus on adapting the existing approach to the NRC operator licensing process to produce training, qualification, and licensing requirements based on the degree of safety reliance attributed to operator actions for the specific plant design. This should take advantage of inherent and passive safety features of the nuclear power plant.	See subsequent iterations and discussions
5. Staff should develop guidance for judging the acceptability of limited scope simulators.	See subsequent iterations and discussions

Interim Letter Report; August 2, 2022

1. There are limitations of the existing QHOs to fully capture the value and risk of nuclear technologies and the large uncertainties associated with evaluating individual and societal risk. This could inhibit flexibility and opportunities for more innovative approaches as the regulator and applicants learn from new nuclear technologies and associated missions.

- Discussed during previous session
- Additional questions/discussion ?

Interim Letter Report; August 2, 2022

2. Critical safety functions are foundational to the licensing process. As such, the requirements for identifying critical safety functions should be common to both frameworks.

- Preliminary proposed rule language includes a definition for *safety function*
- Definition has generic elements, but is bifurcated to acknowledge fundamental differences between the frameworks
- Defining critical safety functions remains an explicit requirement in Framework A (top-down approach); primary and secondary (additional) safety functions made explicit
- Safety functions are addressed implicitly through the principal design criteria in Framework B, consistent with current bottom-up approach in existing framework

Interim Letter Report; August 2, 2022

3. The staff should require, early in the preapplication process, each applicant to identify numeric safety dose criteria, the critical safety functions, the safety design criteria, and the underlying rationale for their selection and application in the design.

- Draft white paper on preapplication engagement for advanced reactor applicants recommends early engagement in several topical areas:
  - Principal design criteria
  - Selection of LBEs
  - SSC classification
  - Source term methodology
  - QA
  - Probabilistic risk assessment
  - Safety analysis methods
  - Fuel qualification and testing
- Pre-application engagement is optional and at the discretion of the applicant

Interim Letter Report;
August 2, 2022

4. The staff needs to ensure that the fire protection requirements in both frameworks are fully technology-inclusive.

- Fire protection provisions in Framework B have been completely revised (aligned with Framework A) and are now technology-inclusive

Interim Letter Report; August 2, 2022

5. The current approach with self-contained requirements for each of the two frameworks is very long. Furthermore, the rule has a significant amount of implementation detail that could be better located in regulatory guidance. The optics of this approach run counter to a streamlined more efficient licensing process, which is an expectation for many stakeholders. As a result, the rule may be too cumbersome to implement and may not be used.

- NRC staff agrees that streamlined and efficient regulatory frameworks are desirable and that guidance used where practicable to reduce the size of the rule
- Each framework in the preliminary proposed rule language must be viewed independently (§ 53.010), with some exceptions
- Requirements in each framework largely replace existing requirements under Parts 50, 52, 55, and 100; either framework is less than half of the existing requirements

Interim Letter Report; August 2, 2022

6. The proposed GLRO description should provide for qualified operating personnel. However, the associated guidance for implementing 10 CFR Part 55 can be amended to accommodate the objectives of the proposed rule without the additional voluminous text.

- Draft requirements in Part 53 are technology-inclusive and significantly more flexible than those in Part 55
- Development of a new category of license operators and facility class requires codification of related regulatory requirements
- Significant amount of new guidance would need to be developed to address recommended approach
- Proposed approach should greatly reduce the need for exemptions while enhancing regulatory reliability and clarity

Interim Letter Report; August 2, 2022

7. The results of the PRA can be used to inform SSC classification by aligning the risk assessment and deterministic safety analysis. This should result, in most cases, in
just two tiers for classification of SSCs: Safety Related/Safety Significant and Not-Safety Related/Low Safety Significant.

- Staff considers two tiers of SSC classification generally too limiting
- Both frameworks generally address safety-related SSCs in a manner consistent with current requirements
- At least one additional tier considered necessary for non-safety related SSCs warranting some type of special treatment due to DID/risk considerations
  - Framework A: Non-safety related with special treatment
  - Framework B: Important to safety

Interim Letter Report; August 2, 2022

8. The simple novel analysis that provides the technical basis for the entry criteria to be able to use the AERI should be documented either in an appendix to the DG-1414 or in another appropriate document (e.g., NUREG).

- Staff agreed with the recommendation and are currently evaluating the most appropriate format for documenting the technical basis for AERI entry criteria, including MACCS validation

Major Industry Feedback

Feedback	NRC Staff Perspectives
Duplicative/overlapping programs	Added flexibility for licensees to organize and combine programs as appropriate to avoid duplication.
Manufacturing license expansion	Expanded activities to include fabrication of entire reactor including fuel loading.
Two tier safety criteria structure	Eliminated two-tiered approach to safety criteria
Unify QA requirements (allow broader set of codes and standards)	Enabled flexibility in using codes and standards; QA requirements consolidated in rule and aligned with Appendix B to 10 CFR Part 50
Normal operations	Decoupled requirements for normal operation from those for LBEs
Add requirements for safe, stable end state conditions	Added requirement and clarified in Statements of Consideration

Major Industry Feedback

Feedback	NRC Staff Perspectives
Not require or rely on just LMP or International Atomic Energy Association approach; Part 53 can be methodology neutral	Created two distinct frameworks within Part 53 to provide clarity and predictability for applicants using either approach; developed DG-1413 and AERI approach
Questioned as low as reasonably achievable (ALARA) in regulations	Staff has added Part 20 references to Part 53. Clarified to recognize that a combination of design features and programmatic controls may fulfill ALARA requirements, as appropriate.
Special treatment for non-safety related but safety significant SSCs	NSRSS SSCs reduce sole reliance on safety-related SSCs; Requirements can be scaled to achieve desired capability/reliability/overall risk
Facility safety program (FSP)	Staff views FSP as an operational benefit. Allows continued use of PRA for evaluating changes, managing risks, and improving the relationship between the NRC's licensing and reactor oversight programs.
More guidance is needed to clarify regulations	Staff agrees and has aligned with industry on future guidance needs

Industry Feedback on Framework B

Feedback	NRC Staff Perspectives
Objectives for chemical hazard requirements are unclear	Preamble discussion includes amplifying information to address this feedback. Chemical hazards in question would include substances commingled with licensed material or those produced by a reaction with licensed material, consistent with similar requirements in Part 70
Rule language is not technology-inclusive in some areas (e.g., references to mitigation of beyond-design-basis events [MBDBE] requirements in § 50.155)	Staff revised several sections to ensure that the proposed rule is technology-inclusive, including MBDBE requirements
PRA development at CP stage is not reasonable	The requirement to have a PRA developed to support a CP application is consistent with the 50/52 rulemaking and other Commission policies
Proposed entry conditions for AERI are too conservative	AERI entry conditions distinguish between plants with relatively straightforward designs and plants with relatively complicated designs that warrant the development of a PRA in order to understand their risk. The proposed AERI option is a departure from current Commission policy, which requires all new plants to have a PRA

Key Guidance Development

Under Development

Existing

- LMP (RG 1.233)
- Siting Criteria (RG 4.7)
- Fuel Qualification Framework (NUREG-2246)
- Developing Principal Design Criteria for Non-LWR (RG 1.232)

Near-Term

- TICAP/ARCAP (NEI 21-07)
- Non-LWR PRA Standard
- Non-LWR PRA Standard Applicability ISG
- High Temp Materials (ASME III-5)
- Reliability & Integrity Mgt (ASME XI-2)
- Molten Salt Reactor Fuel Qualification
- Seismic Design/Isolators
- Emergency Planning
- Change Evaluation (Southern Nuclear Operating Company-led)
- QA Alternatives (NEI-led)
- Facility Training Programs
- Materials Compatibility ISG

Part 53

- *DG-1413, Identification of Licensing Events*
- *DG-1414, AERI Methodology*
- *DRO-ISG-2023-01, Operator Licensing Program Review ISG*
- *DRO-ISG-2023-02, Staffing Plan Review ISG Augmenting NUREG-1791*
- *DRO-ISG-2023-03, Scalable Human Factors Engineering Review ISG*
- Part 26, FFD
- Part 26, Fatigue Management
- Part 73, AA
- Part 73, Cyber Security

Future

- Analytical Margin
- Chemical Hazards
- Manufacturing
- Technical Specifications
- FSP
- Framework B Content of Applications

TICAP / ARCAP – Nexus

Outline Safety Analysis Report (SAR) – Based on TICAP Guidance

1. General Plant Information, Site Description, and Overview of the Safety Case
2. Methodologies and Analyses and Site Evaluations*
3. Licensing Basis Events
4. Integrated Evaluations
5. Safety Functions, Design Criteria, and SSC Safety Classification
6. Safety-Related SSC Criteria and Capabilities
7. Non-safety related with special treatment 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
- 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
- Facility Safety Program (under consideration for Part 53 applications)

- Safety Analysis Report (SAR) structure based on clean sheet approach

* TICAP chapter 2 supplemented by ARCAP ISG Chapter 2, "Site Information."

Additional contents of application outside of SAR are still under discussion. The above list is draft and for illustration purposes only.

FRN Section VII Specific Requests for Comments

Part 53

- Overall organization
- Use of QHOs
- ALARA
- DID
- Earthquake Engineering
- Construction and Manufacturing
  - Use of references
- Manufacturing licenses
- Staffing and GLROs
- OnShift engineering expertise
- Training program accreditation
- Use of simulation facilities

FRN Section VII Specific Requests for Comments

Part 53

- FSPs
- Integrity assessment programs
- Decommissioning
- PRA information
- Changes to manufacturing licenses
- Specific requirements for Technical Specifications
- AERI
- Reporting
- Financial qualifications

Discussion

Final Discussion and Questions

Additional Information

- Additional information on the 10 CFR Part 53 rulemaking is available at https://www.nrc.gov/reactors/new-reactors/advanced/rulemaking-and-guidance/part-53.html
- For information on how to submit comments go to https://www.regulations.gov and search for Docket ID NRC-2019-0062
- For further information, contact Robert Beall, Office of Nuclear Material Safety and Safeguards, telephone: 301-415-3874; email: Robert.Beall@nrc.gov

Acronyms

AA	Access authorization
ACRS	Advisory Committee on Reactor Safeguards
AERI	Alternative evaluation for risk insights
ALARA	As low as reasonably achievable
AOO	Anticipated operational occurrence
ARCAP	Advanced Reactor Content of Application Project
ASME	American Society of Mechanical Engineers
BDBE	Beyond-design-basis event
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 guidance
DID	Defense-in-depth
DRA	Division of Risk Assessment
DRO	Division of Reactor Oversight
EPA	U.S. Environmental Protection Agency
ESP	Early site permit
FFD	Fitness for duty
FR	*Federal Register*
FRN	*Federal Register* Notice

Acronyms

FSP	Facility safety program
GLRO	Generally licensed reactor operator
HFE	Human factors engineering
ILCFR	Individual latent cancer fatality risk
INL	Idaho National Labs
ISG	Interim staff guidance
ISI	Inservice inspection
IST	Inservice testing
KSAs	Knowledge, skills, and abilities
LBE	Licensing basis events
LCF	Latent cancer fatality
LMP	Licensing modernization project
LWR	Light-water reactor
MACCS	MELCOR accident consequence code system
MBDBE	Mitigation of beyond-design-basis events
ML	Manufacturing license
NEI	Nuclear Energy Institute
NRC	U.S. Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation
NSRSS	Non-safety related but safety significant
NUMREL	Number of released plume segments
NUREG	U.S. Nuclear Regulatory Commission technical report designation
OL	Operating license
PAG	Protective action guideline

Acronyms

PRA	Probabilistic risk assessment
QA	Quality assurance
QHO	Quantitative health objectives
REM	Roentgen equivalent man
RES	Office of Nuclear Regulatory Research
RG	Regulatory guide
RO	Reactor operator
SAR	Safety analysis report
SDA	Standard design approval
SECY	Office of the Secretary
SMR	Small modular reactor
SNM	Special nuclear material
SOARCA	State-of-the-art reactor consequence analyses
SRM	Staff requirements memorandum
SRO	Senior reactor operator
SRP	Standard review plan
SSCs	Structures, systems, and components
STA	Shift technical advisor
Sv	Sievert
TEDE	Total effective dose equivalent
TICAP	Technology Inclusive Content of Application Project
WG	Working group

Backup Slides

Nuclear Energy Innovation and Modernization Act (NEIMA)

January 2019

- NEIMA Section 103(4) 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
  - (9) REGULATORY FRAMEWORK—The term “regulatory framework” means the framework for reviewing requests for certifications, permits, approvals, and licenses for nuclear reactors.
  - (14) TECHNOLOGY-INCLUSIVE REGULATORY FRAMEWORK—The term “technology-inclusive regulatory framework” means a regulatory framework developed using methods of evaluation that are flexible and practicable for application to a variety of reactor technologies, including, where appropriate, the use of risk-informed and performance-based techniques and other tools and methods.

Part 53 Rulemaking Plan

- SECY-20-0032, “Rulemaking Plan on Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors,” dated April 13, 2020 (ADAMS ML19340A056).
- In SRM-SECY-20-0032, dated October 2, 2020 (ADAMS ML20276A293), the Commission provided direction to the staff.
- On November 2, 2020, staff submitted a Commission memorandum responding to the SRM direction to provide a schedule with milestones and resources to complete the final rule by October 2024 (ADAMS ML20288A251).
- On November 23, 2021, the Commission approved the NRC staff’s schedule extension request

Part 53 Rulemaking Objectives

1. Continue to provide reasonable assurance of adequate protection of public health and safety and the common defense and security,
2. Promote regulatory stability, predictability, and clarity,
3. Reduce requests for exemptions from the current requirements in 10 CFR Part 50 and 10 CFR Part 52,
4. Establish new requirements to address non-light-water reactor technologies,
5. Recognize technological advancements in reactor design, and
6. Credit the response of advanced nuclear reactors to postulated accidents, including slower transient response times and relatively small and slow release of fission products.

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Subparts H & R: Leveraging and Combining Existing Licensing Processes