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NUCLEAR REGULATORY COMMISSION

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34TH REGULATORY INFORMATION CONFERENCE (RIC)

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TECHNICAL SESSION - T5

TECHNOLOGY-INCLUSIVE, RISK-INFORMED, AND

PERFORMANCE-BASED REGULATORY FRAMEWORK

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TUESDAY,

MARCH 8, 2022

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The Technical Session met via Video-Teleconference, at 1:00 p.m. EST, Andrea Veil, Director, Office of Nuclear Reactor Regulation, presiding.

PRESENT:

ANDREA VEIL, Director, Office of Nuclear Reactor Regulation, NRC

AMY CUBBAGE, Senior Project Manager, Advanced Reactor Policy Branch, Division of Advanced Reactors and Non-Power and Utilization Facilities, NRR/NRC

DARREN GALE, Vice President Commercial Operations, X-energy, LLC

SEAN GROBE, Project Director, Synergy Enterprises, Inc.

DENNIS HENNEKE, Consulting Engineer, Advanced Plants Risk and Reliability, GE Hitachi Nuclear Energy

EDWIN LYMAN, Director, Nuclear Power Safety, Union of Concerned Scientists

DAVID PETTI, Member, ACRS/NRC

STEPHEN PHILPOTT, Project Manager, NRR/DANU/UARP

MOHAMED SHAMS, Acting Deputy Division Director, NRR/DANU

P R O C E E D I N G S

(1:00 p.m.)

MS. VEIL: Welcome back. This is Technical Session T-5, titled Technology Inclusive Risk Informed Regulatory Framework Part 53, Diverse Pathways to the Future.

Our session will explore the development of a new regulatory framework for reactors that will provide flexibility for a variety of novel licensing approaches.

My name is Andrea Veil. I'm the Director of the NRC's Office of Nuclear Reactor Regulation and I will be your Chair for this session. We're very excited to be here in this first day of RIC 2022 and to have so many of you able to join us using this virtual platform.

Our goal is to ensure that this session is informative and engaging and we welcome your participation to make that happen. Let me start by describing a few details about the session.

The session will follow a moderated panel discussion format. After some brief opening remarks, I'll lead a panel session on some key topics with our goal to bring you a broad range of perspectives on

the development of the Part 53 rulemaking.

During that discussion, we'll also be using some live audience polling questions. As a reminder, you can access polls by clicking the word Poll on the right side of the screen next to the Q&A.

Your responses will feed into our discussion real time. Finally, after the panel discussion, we've allotted plenty of time to take audience questions. So please first submit your questions via the Q&A box and we'll try to answer as many of your questions as we can.

The questions can be directed to me or to any other panelists. Please submit your questions as early as you can. There's no need to wait for the Q&A portion of the session to begin.

I would now like to kick things off with our first live polling question so we can really get a feel for the level of familiarity you have with the ongoing rulemaking.

I'll begin introducing the panelist, as the polling question is pulled up and give you a few minutes to answer. Again, you can access polls by clicking the word Poll on the right side of the screen next to Q&A.

Now I'd like to introduce the panelists and I'm pleased to start with Darren Gale. Darren is the Vice President and ARDP Program Manager for Commercial Operations at X-energy, LLC. Darren has been actively involved in the nuclear power industry for over 38 years with prior executive positions with Framatome, BWXT, Day and Zimmerman and Structural Integrity.

X-energy was awarded funding by DOE under the Advance Reactor Demonstration Program to construct a Xe-100 high temperature, gas cooled reactor near Energy Northwest Columbia Generating Station Nuclear Plant in Washington State.

Dr. David Petti is a member of the NRC's Advisory Committee on Reactor Safeguards. David was formerly the National Technical Director of DOE's Advanced Reactor Program.

His work included numerous Lead and Chief Scientist positions at the Department of Energy, Idaho National Laboratory and the Phebus facility at Cadarache nuclear site in France.

He was recently elected to the National Academy of Engineering. Dr. Ed Lyman is the Director of the Nuclear Power Safety at the Union of Concerned

Scientists.

Dr. Lyman is an internationally recognized expert on nuclear proliferation and nuclear terrorism as well as nuclear power safety and security.

He is a member of the Institute of Nuclear Materials Management and has testified numerous times before Congress and the NRC. Ed has been actively involved in stakeholder discussions on the Part 53 rulemaking.

He earned a Doctorate in Physics from Cornell University in 1992. Dennis Henneke is a Consulting Engineer at GEH Nuclear Energy. Dennis is the Technical Lead for the PRA supporting the BWRX-300, VTR and NATRIUM reactors and was the principal investigator for the DOE funded project for the PRISM Reactor on Development, Modernization of an Advanced Non-Light Water Reactor Probalistic Risk Assessment.

Dennis is also the ANS Chairman of the ANS/ASME Joint Committee on Nuclear Risk Management and has supported PRA Standard Development since 1999, including non-LWR PRA Standard.

Now let's take a look at the results from our first polling question before I begin

introductory remarks. So it looks like overwhelmingly about 48 percent say, I've heard of Part 53.

There's 16 percent that said, what is Part 53 so you're in the right place to learn about it. I've attended a few meetings, 19 percent. And 17 percent, I've attended most meetings and have read preliminary rule text.

So with this wide variety of familiarity with Part 53, I hope we can increase that level of familiarity today or fill in some of the gaps for those of you who are already familiar.

Now I'll provide a brief discussion of the Part 53 rulemaking to provide some explanatory background before we move to the panel discussion. Next slide please.

As required by the Nuclear Energy Innovation and Modernization Act or NEIMA, the NRC staff is committed to developing a technology inclusive, risk informed regulatory framework, Part 53 rule, that provides at least the same degree of protection of public health and safety and the common defense in security for advanced reactors that is required for current generation light water reactors.

Our goal is to develop an innovative, predictable and appropriately flexible framework to enable a streamlined and efficient licensing process for advanced reactors.

The regulations will accommodate various advance reactor technologies, prioritizing risk informed and performance-based licensing approaches to protect public health and safety throughout the life of a facility.

NRC staff has engaged in extensive stakeholder outreach during the rulemaking process and has received diverse and significant input. The staff has been implementing a novel approach of releasing preliminary rule language to facilitate discussion.

I'm proud to say we now completed the first draft of all preliminary rule language. The staff has considered stakeholder requests for a more traditional deterministic licensing framework for advanced reactors.

In addition, the staff recognized that more time was needed to further engage stakeholders including the Advisory Committee on Reactor Safeguards and iterate on rule language before

sending a proposed rule to the Commission.

Several organizations also noted support for a schedule extension for the proposed rule during our public interactions. To this end, in October 2021, the staff requested a nine-month extension to the Commission directed schedule for Part 53 and the Commission has approved the staff's request to fully develop this licensing alternative.

The staff is committed to developing an effective rule and following the NRC's principles of good regulation. The NRC will continue to seek stakeholder input throughout the rulemaking process.

Let's display live polling question number two now. While that question is coming up, I'll begin our panel discussion as we wait for the results to come up and we'll have plenty of time for you to input your answers.

Now, just a note, we're going to stop the discussion at about 2:00 p.m. to allow plenty of time for Q&A. So I'll first like to start with the first panel question.

How are we meeting the objectives outlined in NEIMA and are we headed in the right direction? And let's start with Darren and then any

other panelists who want to speak.

MR. GALE: Thank you, Andrea. So X-energy, I think most of you will recognize, you know, as Andrea pointed out, as one of the awardees under ARDP.

With the timing that the Department of Energy and Congress had with ARDP, we have chosen to go the two-step process, Part 50, for the deployment of our reactor at the station near, you know, at the site near Columbia Generating Station because of the timing for us.

It's, we're not going to get through the 53 rulemaking in time for that, but there clearly are advantages to Part 53 in subsequent deployments of our Xe-100 plan.

So again, the two things for us that are most important are the technology inclusive, so we need to make sure that we're looking at all technologies here not just, you know, focused on a select few.

But very technology inclusive and then the time limits, making sure that we have the efficiencies with this process that we maybe haven't to this point realized with Part 52.

I think we all thought with Part 52 that we were going to create something that was going to save us some time, but we haven't really learned how to do that yet and with Part 53, I think we've really, really got to do that.

So again, those two things, the technology inclusiveness and the timeliness, effectiveness of it, those are the things that we're really, you know, that if we focus on those and continue to focus on those, I think we're going to absolutely be doing the right thing. So that's how I would answer that question.

MS. VEIL: Thank you, Darren. Ed, would you like to give your perspectives?

MR. LYMAN: Yes, I would. I appreciate that. Thank you. So in my view, the direction of Part 53 is going in a way which I think is less consistent with the intent and even the letter of NEIMA.

And just to be clear on this, and I was involved in many discussions as NEIMA was being developed and I testified twice on legislative hearings on it.

My strong sense is that the purpose of

that was to promote the development of advance reactors. And although the definition of the advance reactors, you know, is up the holder and there is a definition in NEIMA, it just seems clear to me that it was meant to promote the reactors with advance reactor characteristics, additional safety features, and the like.

And so the recent change to the scope of Part 53 to refer to any commercial reactor which would also include light, large light water reactors that have already been certified, for example, like the AP-1000, I think is or even reactors without the second passive safety features as the AP-1000, I feel like that is missing the intent of NEIMA that there's a qualitative threshold for a reactor to be able to qualify for using a different approach than Part 50 or 52 that would potentially provide easier licensing than that.

And to qualify for that, I think there has to be a demonstrated threshold that this reactor actually is going to have credible, there's a credible reason to believe that it will have enhanced or security features compared to the current fleet.

So although I understand the logic of

opening up the scope to anything, I do feel like it is the NRC's missing opportunity to use this as an incentive for new reactor applicants to follow through on claims of having inherent or advanced safety features in their designs.

And so this was also tied to the advanced reactor policy statement of the goal that NEIMA or Part 53 shall not legislate safety that's greater than the operating fleet.

I do think that's also missed opportunity in the part of the NRC and the Commission to move the, you know, commercial reactor fleet in this country in the direction of increased safety which I think would be appropriate if there's going to be greater deployment in the future.

So I am concerned about that direction and also with regard to NEIMA's performance-based licensing approach, that had, the NRC was given -- NEIMA gave the NRC the authority to determine where that's appropriate.

And I would caution the NRC that it should keep in mind that the use of performance-based and risk-informed approaches is not always appropriate and not every instance and that they

should look at that constraint instead of doing what the staff is trying to do essentially rewriting the entire licensing framework for all new reactors in a way which may make it harder to understand where risk-informed features are more or less appropriate.

And maybe I went too long. Thank you. I'll stop there.

MS. VEIL: No, thank you, Ed. Dennis, I see your hand is raised.

MR. HENNEKE: Thank you, Andrea. Yes, I'm going to kind of talk more about the risk-informed portion of it just to kind of give you a flavor of how we think we're doing in that portion.

I'm a PRA guy doing risk and safety analysis for plus some 40 years and risk application like this informed risk and a lot of people have difficulty understanding what truly risk informed and what truly performance-based applications are.

And I think overall we're pretty excited about Part 53 to be able to transition to a much more risk informed and performance-based approach and there's been a lot of great progress in that area.

I agree with what Ed just talked about trying to apply this to advanced plants. You know,

what we're proposing for advanced plants would pass and the inherent features are a factor of a hundred to a thousand times safer for public safety simply done in this completion.

And you look at that, you know that should buy us quite a bit on the regulatory ruling on certain aspects of it that can be supported by risk assessment.

But I think the progress is slow simply because a lot of the first words or the preliminary words that come out in the rulemaking may have appeared on the surface to be a performance based or risk informed, but they end up having the determinative second underlying set of requirements.

A good example of that is the seismic wording that came out just last month that talked about all components, SSCEs that are safety related and non-safety with special treatment shall be seismically qualified. That's not risk informed.

You really only want to have those components that are required to get to shut down in case of a seismic event, seismic and qualified and you would have different qualifications for those that are safety related than those that are non-

safety or special treatment.

We made good progress on the operator side with the certification of requirements for operators because a lot of these plants are going to have a low-risk significant operator action.

So called walk away safe, although membership doesn't like that term, but you know, there's passive and inherent features that operators really aren't needed to shut down the plant unless multiple (inaudible).

And so are the requirements for operator certification while on the other hand, the human factors engineering, the HFE program requirements that underline the design, the control room, the design of the plant were still very determinatives that you still have to run scenarios on your simulator associated with, for example, station blackout when station blackout might not be most important at all.

So I think every time the words come out initially for the preliminary words for the rulemaking, there's almost always a deterministic portion of it that maybe the NRC hasn't thought well about that they really should have thought if, can I risk inform this better? Can I do a better job on

that?

Ask your PRA guys and then when you've thought about that, bring it to us because right now what we're having to do is the industry gets feedback. This isn=t risk informed, let's go ahead and think about this better and then we go into discussion.

And the NRC has been very good about modifying the areas where they can find leeway to give, but in the meantime, it's just causing us time and schedule in the overall process.

But back to the initial, you know, we're all real happy with the direction of the rulemaking and we just look forward to working with the NRC to improve the risk-informed portion of the rulemaking requirement.

MS. VEIL: Thank you, Dennis. And everyone for your perspectives on that question. And the second question we touched on a bit, but I want to get a little bit more granular here.

How can we start the appropriate balance between flexibility and predictability? And I'll throw that out to whoever wants to address it first.

MR. GALE: Andrea, I'll start with that. So I think what, you know, if you can clearly define

at the beginning, you know what are the measurable safety objectives, what are the functions, what is the criteria that we're specifically, you know, managing and what are the, and the sources of uncertainty to that?

So I think if we can clearly identify all of those up front, then it will be more easy for us to approach the, you know, our preparation of the applications, preparation of the, you know, the technical papers that we put in to the NRC for the reviews of these regulations and our approach to that then so the balance, you know, we'll be able to help provide that balance between the flexibility and, you know, efficiency if you will.

But I think it's clearly defining all of those up front, what are the true objectives, what are the true measures and then allowing the vendors and utilities, the operators to then, you know, put that approach together that can create the balance.

MS. VEIL: Thank you. And I saw Ed's hand and then Dennis.

MR. LYMAN: Yes, thank you. So I am concerned that I do think there is a tension between flexibility and regulatory. It's a certainty, but

maybe a shortness and danger is that if you go too far in the direction and I do fear that Part 53 is going too far in this direction of not having a sufficient number of inspectable and clear regulatory criteria in the rule itself.

That is not only going to make it more confusing for the public to understand what is actually being accomplished in licensing these reactors, but I think it will be harder for the actual review because I don't believe these very complex safety and security issues that are going to come up in these reviews.

That will have to be dealt with at some level. If it's not in the rule, it's going to be in the guidance and in the request for additional information, the back and forth.

And if the staff is forced to have to clarify over and over what exactly it means and the applicants are going to have to explain, you know, in these how they interpret these vague rules, I feel like that could actually lead to less certainty because of this lack of clarity.

So I would, I think it would benefit every stakeholder if the rule itself had some more

specific performance and, in some cases, where appropriate, deterministic requirements to reduce that uncertainty.

MS. VEIL: Okay, I see Dennis and then Dave.

MR. HENNEKE: Great, I appreciate it. The, both the, what GEH is working on both the BWRX-300 reactor and the NATRIUM reactor supporting Terrapower.

Both are currently proposing to go under the Part 50 or 52 probably Part 50 licensing approach as simply for predictability. Predictability is money. Right?

So it's, if we lose a year of schedule on the reactor, it can make the difference between becoming profitable and not profitable and then the other part is, you know, are we going to build a second or third plant in that reactor type.

So we have a predictable approach from the Part 50 then and the problem we see right now in Part 53 really has to do with the additional requirements on the Part 53 many of which we've seen in industry letters to the NRC that maybe haven't thought them fully thought out as far as a support

for a why those additional requirements are in the rule such as ALARA and other areas.

Now, there's no question that for advanced reactors as Mr. Lyman has mentioned, we are looking at much lower risk plants in general with advanced safety features.

So we expect to have some additional consideration for beyond design basis accidents, but to have a safer plant and then now add in additional requirements is not part of the Part 50 like ALARA. It does remove the predictability. It does.

And so plants are going to continue with Part 50 until we can figure out if we can, if that burden to go into Part 53 is not that large. So I think re-thinking these extra portions of it, some of which we expect there to be, you know, some advancements and some additional requirements, as long as that's not too overly burdensome, the industry would really benefit from that particularly. Thanks.

MS. VEIL: Thank you. And, Dave?

MR. PETTI: Yes. So before I begin, I just want to let folks know that my opinions are my own not those of the ACRS. Those are found on the

official website. I think this is an inherent problem.

Even what the task at hand is. To go across all the technologies that we're talking about, there has to be more flexibility and you give up predictability as part of that as the focum, you know, the balance.

What's flexible for one technology, may not be for another. And so it's very hard to write more prescriptive rules at the higher level when they may not apply to all the technologies because the technologies are very different when you get into the details.

And the devil is going to be in the guidance because there's just no way to stick that all in the rules. So I think it's important to understand that that's sort of inherent in what the staff is trying to do. Thanks.

MS. VEIL: Thank you. And before we look at the results of polling question two, I'll ask one more question and this is specific to Darren and Dennis. How important is Part 53 to your business plans?

We've heard about a little bit earlier

from Dan with the timing issue, but if we could just flush that out a little bit more.

MR. GALE: Yes, Andrea, thank you. So again, your point about the timing, you know, obviously with what we're doing out in Washington State right now and the time of that with moving forward with Part 50 as Dennis talked about, some of the same reasons we're doing that at this point, again, the subsequent plants that we would deploy would clearly set themselves up for a Part 53 type process.

Again, any time, you know, at this point any first deployment without the predictability, you know, of a seasoned rulemaking, you're going to go with what you've done before for that very reason you got significant investment going on and the risk of going into unchartered waters with that.

People just aren't going to take on so once we have an operating plant, once we got a plant that is under regulatory approval, then we'll have operating experience, we'll have some other things that will probably help get us through maybe an initial Part 53 rulemaking process and then set itself up for subsequent ones, you know, after that.

So we clearly see that as we will definitely be looking at that type of approach down the road if, again, if we do get the efficiencies out of the Part 53 process.

We are certainly gearing up to going that approach down the road so. So yes, it, the importance, yes, we see it as a key part of our business down the road.

MS. VEIL: Thank you. Dennis, would you like to comment?

MR. HENNEKE: Yes, I think I'll keep it brief because I think I agree with what Darren said. You know, it's we're moving under Part 50 initially for all the reactors, but you can see longer term then, you make a safety case under your application and if the safety case for Part 53 is less burdensome to maintain and then the operation of the plant is less burdensome, then the second and third and fourth plants that we build will definitely move in that direction.

And that's going to be key to making sure the industry succeeds as to not have the expense of maintaining a license that we do on the current Part 50 so I think for initial license, it's not part of

our business case, but for the long-term survivability of what we're trying to do it's very important.

MS. VEIL: All right. At this point, I'd like to pull up the results of polling question two. It's really relevant to our next discussion on stakeholder engagement.

The engagement really has been a cornerstone. You heard in the remarks I think by certainly by the Chairman and other Commissioners how extensively we've been engaging with stakeholders and that was part of the reason for requesting an extension.

So the engagement is very important to us and we want to kind of get an idea of whether or not it's about right, too much, too little. So as we're waiting for the results of poll question two, we can kind of start the discussion.

What do you think are the key lessons learned from stakeholder engagement so far?

MR. GALE: Andrea, I think one of the key ones we've learned is just an appreciation for how challenging it is to develop risk-informed performance, you know, performance-based rules for a

wide variety of technologies.

You've heard Edwin, you've heard Dennis point it out, these are very different designs and key areas of their safety focus or may be in completely different parts of the plant.

One may be a fuel-based safety focus, another one may be the operating systems-based safety focus so it really, it's difficult to, you know, to be all encompassing all at once.

And, Dave, I really appreciate your comments and that, you know, what the NRC faces with how do you make it efficient, but make it good for every single design out there?

So I think that's a lesson learned is just an appreciation for that and so it is difficult. It's not something we can just turn out overnight, you know, and have a panacea so I think that's one of the significant, you know, key lessons learned, I think.

MS. VEIL: Okay, thank you. I see Ed and then Dave.

MR. LYMAN: Yes, thanks. One of the, my observations from this process and it is a different approach to rulemaking than is typical with as much

higher degree of involvement of various stakeholders which primarily means the industry.

It does not appear that it wasn't the most efficient way to move forward with this. And it does raise difficult questions in my mind that the influence of the regulated parties on the NRC's development of rules.

And so I'm not sure it was really, it's been superior to a more traditional process, where the NRC's notice and type of rulemaking where every stakeholder including members of the public have a clear, but relatively limited role in development of the actual language.

And then there's a paper trail, a very clear record of where the various parties' comments on those rules, where they disagree with the NRC and have the NRC resolve it.

So I am a bit concerned that this has led to an excessive degree of industry involvement and the industry's not monolithic and that's led to some confusion as well.

Oh, one other thing I would say is I do think a regulatory basis is needed, was also decided not to take that step in this rulemaking, but I think

it's officially complex that would really suit, it would be appropriate for again, for documenting why decisions were made as far as the particular rule text when it finally comes out.

And I really feel it's important to have some sort of a cross walk if this is going to be equivalent to the current level of safety that there has to be an understanding or everything has to be laid out every time there's a change to a current requirement explained, but it's the basis of that change and how it doesn't fundamentally change the level of safety, the current rules.

MS. VEIL: Thank you, Ed, and before we go to Dave, if we could get the results of polling question two on display and, Dave, go right ahead.

MR. PETTI: Okay, so I just wanted to expand upon this balance that the staff is trying to strike between predictability and flexibility, I mean you look across the technologies, Dennis is right.

What I like about Part 53 and particularly the risk-based approach, is that it should help you focus very quickly on the really safety important things to worry about in design.

And they're going to be very different

across the technologies, but you're not going to waste a lot of time in terms of, you know, the review and being stuck on something because all of that used to be an issue over here with technology expert.

It is an issue here with technology why. It should help increase the focus, and in fact, we're seeing that today with some of the plants that are coming in pre-application.

They're very different in their technology and the issues rise to the top very quickly and they cause a focus. And that I'm hoping will solve, the overall level review process.

MS. VEIL: Thank you, Dave. And I know the next question. I'll go ahead and start with Dennis because I know he's going to want to speak on this one.

What should the role of a PRA be in design, licensing and operations? For example, enhanced, traditional, or none?

MR. HENNEKE: I appreciate the question and stop me if I get too much into the PRA nitty gritty, but I think the NRC and the industry have had a lot of conversation on that.

I think the conversation's been really

good. And to simplify it down just a little bit, I guess the answer is it depends. Right? So if we're talking about a, you know, we've talked about a variety of advanced plants, all the way from microreactors all the way up to, as I'd mentioned, potentially a larger reactor, but generally SMRs. Right?

And most of them are quite safe. But there were reactors that are I think inherently safe from a public standpoint. These are through because they're such a small source term like a micro reactor or because they have inherent features where the possibility of release is very unlikely even given severe act of omissions where field damage would normally occur from most reactors.

So this is the advanced fuel type of a reactor approach. For these types of reactors, you could make a qualitative argument that's still a risk assessment, but it's qualitative.

And as a result, a PRA may not be needed. Now for most of the advance reactors we still have to prove our safety case. Right? So we have more of a Natrium reactor for example, the sodium reactor, 300 megawatts.

It's a very low risk reactor because it has a passive air cooling, has passive features such as inherent reactivity feedback, gravity, wide drops and if you look at the overall risk, it's quite, quite low.

But still the PRAs are going to be important, especially if we now start using the PRA to do risk-informed applications such as determination of safety classification for the components.

So I think there was a range and I think the first attempt at what the white paper from NEI and later the work from the NRC totally gave a variety of approaches, is correct.

But I think a lot of it has to do really with the inherent features and the relative risk of that plant from a public perspective. Thanks.

MS. VEIL: Thank you. And I see Dave's hand and then Ed. Dave, is your hand still up from before? Did you want to comment on this?

MR. PETTI: No, I wanted to comment, but I can't -- oh there we go. Okay.

MS. VEIL: Yes, we can hear you.

MR. PETTI: I just wanted to say, yes,

to say that beyond, you know, what we think of as the traditional PRA done on light water reactors, I agree with Dennis.

The answer really depends on the system that you're looking at, but that there are a number of risk tools in the risk toolbox that provide a lot of value without necessarily going all the way to (inaudible) and the event trees and cut sets and all of that.

And they can be very important in design. They're used heavily in other industries like the chemical industry to really get a better handle on what you think the system is like and how you think it actually behaves in an integrated manner. And this is the specifically true for a system that we have no experience with.

Where either the fuel, the coolant moderator, any of them, we've never used in combination and so how it actually behaves is just not known well enough. And these risk tools can be very, very helpful without going to a full "PRA".

MS. VEIL: Thank you, Dave. And before we go to Ed, I just wanted to comment on the results of polling question two. And the question was about

how much engagement.

And it looks like overwhelmingly 41 percent said unsure, 14 not enough, 32 says just about right and 13 percent says too much. So Ed, you were next and then Darren.

MR. LYMAN: Yes, just following up on Dave, I have pretty strong concerns about a licensing approach for new reactors that depends too heavily on PRA results that don't have, that haven't been validated with industry experience.

So you know, again, this goes back to where it's appropriate and where it isn't to use risk-informed approaches. That said, I don't see much value in developing a Part 53 that does not incorporate, let's hope that it will incorporate a PRA where appropriate and respecting its limits in accordance with the PRA policy statement and not going beyond the state of the art and taking uncertainties into account and requiring a defense in depth and where deterministic requirements with PRA use isn't appropriate.

And then once you have that framework then to come up with a deterministic alternative which is sort of like Part 50 light, so what I'm

afraid is going on here and this relates to the earlier remark I made about applying to current generation reactors, is that he may end up with a parallel licensing process that's mostly deterministic, but not as stringent as the current process for, you know, the Part 50 or 52 and then it doesn't seem clear to me that that's necessary.

The applicants who do not want to go the risk informed route with a PRA can simply stick to Part 50 and 52.

MS. VEIL: All right. Thank you. I see Darren's hand was up and then it went back down. Oh wait.

MR. GALE: Yes, I would just say that, you know, beyond what all the other panelists have said that the PRA as a tool goes beyond just the regulatory side of it. It's helped as a design tool for us.

When you go from conceptual stage all through a final design, informing yourself, you know, may be eliminating some of the, you know, the hazards or as you're going along.

So the PRA as a tool, is helpful throughout the process. Now, again, in rulemaking

and regulatory space, is it the right thing to do? You know, with Edwin's comments about untested or unproven and with certain things, clearly, you know at this point in time, we're most of us are looking at both. Right?

We're looking at the deterministic values as compared to what the PRA is giving us so at this point in time, we have no clear only PRA-type approach that we're doing so we're getting some sense of how good the PRA approaches are because right now we're looking at a lot of the key safety areas with both.

So what's the best balance with Part 53? Again, we'll have to continue to look and I'll, you know, I'll defer to experts like Dennis on that, where we go with that because I'm certainly not one of them. I'll admit that right now.

But again, you know, it's more than just a regulatory tool at this point in time when we think of PRA because it's how it's helping us inform the design throughout the process from conceptual to final.

MS. VEIL: Oh, thank you, Darren. And we'll do one more question before we move to the last polling question. And then also to leave plenty of

time for Qs and As.

So this question is, are there any unique considerations that should be considered in Part 53 with regard to non-traditional uses of nuclear energy such as process heat or industrial applications and new entities that have not owned or operated nuclear reactors before. Dennis, I see your hand is up.

MR. HENNEKE: Great, Andrea. I appreciate it. Let me, there are a lot of considerations there. I've been in a number of IAEA meetings where worldwide, it's quite interesting what is being proposed all the way from desalinization to, you know, uses have already been in place, other places, just to provide heating and hot water to towns or industrial uses.

I did want to focus on one aspect of it that important from a regulatory standpoint is and that is, we'll call it a decoupling process. And the natrium reactor itself is, uses molten salt core to heat up a molten sodium loop that goes to molten salt tanks that store up the energy and allow the plant to put out more power during the day when it's needed and the less power at night when it's not needed and the reactor just remains at the same power level.

And the hot tanks and the cold tanks go up and down depending on what power level is needed. And that decoupling, we call it decoupling because regardless of what happens on the term in generator side, at a balance of plant side, you could lose cooling water, you could trip the turbine generator, the reactor itself doesn't, isn't initially affected.

And you could, depending on the level of the molten salt tanks, continue to operate for some time or you could just reduce power down and continue to operate.

And then, I mean, if you can show a decoupling on whatever the industrial use is, whether it's a molten salt tank, whatever you happen to be, as long as we can now take those traditional requirements that you might have had on the turbine generator and on the intake structure, and all of those things that just really don't affect nuclear safety and simplify those down to reduce them to minimal, that really is going to be helpful to these applications.

So we don't have anything in Part 53 specifically on decoupling, but the risk-informed approach would allow us to move in that direction so

just something to think about on that.

MS. VEIL: Thank you. And I think I saw Dave, Darren and Ed. And apologies if I got the wrong order.

MR. PETTI: Yes, so I was going to make the same comment as Dennis that this decoupling of the reactor from the application, I think there are certain technologies and design solutions that work.

MR. HENNEKE: Yes.

MR. PETTI: Now a bad designer can design a reactor that's going to have a huge interaction if there's an upset in terms of the end-use of the energy, but I think a good designer will look at ways to uncouple that.

And I think in the advanced technologies, there's more than one technology that has these positive attribute so that you can not have to be as concerned about the impact of the end use of the energy on the reactor so.

MS. VEIL: Thank you. Ed and then, or I'm sorry, Darren. I think you were --.

MR. GALE: Yes, so and I don't have anything different to say other than what Dennis and Dave just said, but other than the fact that what we

have seen globally is that the percentage of industrial applications are much more carbon based than when you think, when you look at electricity-based generation around the world, so that in fact, decarbonizing the planet on the industrial heat side is actually even more significant going to nuclear.

It is a much, it's a bigger, you know, decarbonization footprint by utilizing nuclear on the industrial heat side. So this is a very key and important part of Part 53 is knowing and understanding that down the road the uses of nuclear power are going to be for companies that historically have not been in nuclear and have not, you know, have just been burning carbon-based products to create that higher temperature process heat that they need so it's something we clearly need to focus on in this rulemaking.

MS. VEIL: Thank you. And Ed?

MR. LYMAN: Yes, I think there are certain aspects where the decoupling, you know, may not be possible. And in particular, if you're talking about processed heat and the potential that you have a nuclear reactor close to the, you know, chemical plants, then you're going to have to worry

about the external hazards posed by the plant on the reactor.

Now that I think is already, should be accommodated by the rule, but it may need to be a little more explicit on how, you know, those impacts would be assessed.

And then it goes the other way as well. What about the impacts of reactor accidents on the safe operation of a hazardous facility? So there are interactions and it may make sense for some specific provisions to make sure those are fully addressed.

MS. VEIL: Thank you. And your answers were so crisp that we could do another question before we go to polling question three. And that is, how do you see the role of prototype or test reactors in the deployment of advanced reactors and how should Part 53 facilitate this approach? And I see Dan, or Dave's hand up.

MR. PETTI: So I think that the prototypes are really important if a concept's never been built before. So I'm not saying gas reactors, I'm not saying sodium reactors. Many of those have been built, but there are other technologies out there under consideration that have never seen

neutrons.

And that's why I think a prototype would be useful. It's also in the broader engineering sense. I find it interesting to hear comments about this.

The chemical industry used pilot plans for any new process that they develop. When you've got this first of a kind, the prototype really helps you in terms of scaling up the process from an engineering perspective.

You've got a write procedures and operational procedures. If you've never done anything at any significant scale beforehand, how does one do that?

No, usually, you start with components and you write the procedures and you learn from the components you integrate them together, you have some sort of a loop. Maybe a very small reactor and from that you then develop the bigger reactor.

That's how reactor development has been done around the world. And it's not by accident. It's good engineering practice and so I don't see us, you know, deviating from that. And I think it should be part of Part 53 as an option.

MS. VEIL: All right, I think it was Ed and then Dennis.

MR. LYMAN: Yes, I would strongly agree with that. I think that and taking some issue with Dennis that the problem is that if you do have reactors that have not had, you know, they may have had some test or demonstration experience, but not necessarily captured features of current designs that are critical for making the safety case, that you do need a prototype testing to demonstrate some of these inherent safety features before you can have confidence that they can be licensed with, you know, what are called an operational flexibilities or however you want to characterize it.

I would say a margin reduction. So I think prototyping has to be a critical part of that and the current language and 50.43(e) I guess regarding prototypes is ambiguous.

I don't think it has clear criteria for determining when or at what point the NRC would decide the prototype is information is necessary which could impact schedules.

So I really would hope the Part 53 would have more clarification of that and perhaps

milestones decision making where applicants are notified that they're going to need to build and demonstrate a prototype if they want a particular regulatory relief to be able to take advantage of that. So I really would hope that those requirements for prototypes would be clarified in the rule.

MS. VEIL: And Dennis?

MR. HENNEKE: Yes, and thanks, Andrea. I don't disagree with what Ed said. I think, you know, prototypes for reactors we haven't operated prior is going to be super important.

Luckily, in the sodium reactor space we've had a long history of sodium reactor operation. For example, EBR-II ran for over 30 years and it has the safety features that we are going to be utilizing and the current generation of sodium of fast reactors so, but you know, molten salt reactors are going to need that.

And I know Kairos is moving in that direction and so it's a little important. The aspect that nobody else had covered yet though is let me talk about the testing.

Currently, the Department of Energy is proposing to test a lot of the advanced fuels and

materials in the Versatile Test Reactor, VTR. And unfortunately, the funding on that has dried up considerably and that has delayed.

And as a result, you know, a lot what we're going to be building for some of these reactors will not have a lot of the testing we need for advanced materials especially or advanced fuels and so they'll move forward with what we know, the types of materials and fuels that we know.

And I think we could make a lot of progress in the area of safety if the VTR were completed so completing the VTR is super important for I think everybody's sake so. Thanks.

MS. VEIL: And Darren?

MR. GALE: Yes, you know, like what Dennis said, the history behind high temperature gas cooled reactors goes back for many decades, not just many years, many decades.

And we also at X-energy, will be in our planning a series of helium loop testing that we'll be doing of components so we will not be, obviously, setting up a prototype reactor, but we're certainly going to be doing some irradiation of our fuel compact, the pebble, and we're going to be setting up

some, you know, high temperature helium loop tests for the component.

So again, we're pseudo setting up prototype testing in the reactor without actually doing the prototype reactor itself. So I think clearly where you got technologies that have never been used before, setting it up in some type of prototype reactor is probably, you know, probably the right thing to do from an engineering standpoint.

MS. VEIL: Thank you, Darren. And as we get ready to move into Qs and As, can we get the last polling question, question number three displayed and then I will start with the Qs and As.

So Darren is on the screen and I believe the first, nope, the first question is for Dennis. Dennis, what is your view with regard to the security risk-informed and the role of security vulnerability assessment in the context of performance-based regulatory framework?

MR. HENNEKE: Right. That's a great question. Under the JCNRM, Joint Committee on Nuclear Risk Management, we have a working group on risk informed physical and cyber security, the two working groups that are looking at that.

Hate to correct Mr. Petti's wording, he used the word risk-based. For us in the PRA, I'm not sure risk-based isn't kind of like a four-letter word. You know, we try not to use it.

What we're looking at is a risk-informed approach and there are different approaches, but you know, you use the risk assessment that you have, typically a PRA.

And then, you know, regardless of what the results show, you always ensure you maintain a defense in depth and you ensure you have adequate safety levels.

When the risk assessment can't cover that aspect, then we move into a deterministic of requirements. So if you haven't done the risk assessment, even under the licensing modernization project for example, you would default to a deterministic approach.

Now security is an interesting one. We can't do a traditional PRA because the PRA looks at both the consequences of, you know, what happens when something is damaged as well as the frequency.

And the frequency of the security event is the hardest thing to estimate. All right, you

can't predict what somebody may do to the plant for a variety of reasons whether it be an aircraft crash or just a security event overall, security breach.

The risk-informed security working group is working in that area to try to at least look at the relative frequencies and see if they can help with that.

But I think the longer term and then I'm sure Mr. Lyman would agree, is I don't think in the short term we're going to be able to risk inform security fully.

We can use risk information as the current fleet is using risk information in regard to target sets from the PRA and in the level of damage of maybe seen for various events, but with regard to removing a lot of the chart that determines the criteria associated with physical securities, we can get there to a certain extent and take credit for passive features, inherent features of the reactor.

But I still think that would be a fairly large deterministic like overlay on the requirements until we can do a little bit better job on estimating frequency of various events. Appreciate it.

MS. VEIL: Okay, thank you, Dennis. Now

the next question is for me. It says, how has information from the Canadian Nuclear Safety Commission, especially their SMR testing at Chalk River helped support development of Part 53 for addressing diverse safety and environmental points of view on licensing new and advanced reactors?

And this is not specific to Chalk River, but we have a Memorandum of Cooperation with CNSC and we've been coordinating for a while with them on various aspects including development of Part 53.

And one of the specific examples is, actually came from feedback in meetings as well, is to make sure what we're doing is not impacting in a negative way international standards.

So as we're developing Part 53, we're interacting with CNSC to make sure there's this global approach and we're also interacting with them on fusion.

As you heard the Chairman mention, we're in a learning phase of giving options to the Commission for their consideration and we will be submitting a paper to the Commission with regard to fusion.

So the next question is for Ed. This

question combines two questions we received. And it says, why would you exclude certain reactors from Part 53 simply because of the kind of coolant they use? And likewise, what specifically is your concern with all reactors including non-passive plants using risk-informed licensing? Wouldn't the process account for different types of technology?

MR. LYMAN: Yes, and to be clear, I only singled out large light water reactors because that's what the current fleet consists of so we're essentially talking about anything new compared to the current fleet.

But the point is, if reactor design comes for, if there's an application for reactor design that doesn't have a clear case for saying that it has significantly enhanced safety which means that maybe the NRC can take certain liberties with the existing licensing approach, why should have the benefit of being able to enter into this alternative approach?

And if, and again, it raises the potential that these new facilities may be licensed under a regime which is not comparable in safety. I know the goal is to make Part 53 comparable, but you know again, there's, there are going to be a lot of

I think lack of, there's going to be a lack of clarity in a number of different areas that don't have to do with fundamental reactor design issues.

The operational programs like operator licensing requirements, things like that, these are already well established for the current fleet. And I just feel like this is opening the door to a sort of parallel, but weaker process potentially for any new applicant which could possibly lead to an overall decrease in safety of the fleet. So that's my concern.

MS. VEIL: Thank you. And the next question is for me as well. Does this mean we would develop a new SRP or Standard Review Plan, for advanced reactor reviews which would apply to all types of reactor designs?

No, we're prioritizing the development of technology inclusive regulatory guidance and consensus codes and standards. We have very significant activities under way now.

For example, we are developing the technology inclusive guidance for content of applications to help applicants that are coming in to be clear on what they need to provide.

So the next question is for all panelists. Let's see. The iterative rulemaking process with partial releases, comment taking, and reconsideration is inherently inefficient, as Ed notes, but can result in a more widely accepted final product or not.

Do you think use of this process for Part 53 has helped or has it just caused additional frustration amongst all stakeholders because of the multiple rounds of engagement?

So let's start with, I'm looking at Dennis. Let's start with Dennis to get your thoughts on that and then anybody else can raise your hand if you want to comment.

MR. HENNEKE: I appreciate it, Andrea. I think I mentioned it earlier and I wouldn't say it's so much frustration, I think it just takes extra time overall and I think it's going to delay the process.

It's not that, the overall process of engagement and discussion and then revision of the rule, the direct rule, I think is a very positive aspect of it because it's not just taking the industry comments, it's taking Mr. Lyman's comments, whoever wants to comment on it.

And then the NRC weighs that as they should independently and then come up with what they believe to be the best approach. The problem we're seeing is that the amount of engagement is just too high. For me, it's again back to that the original wording that was released is just too deterministic. It's just too much similar to the old wording that requires a little bit too much engagement.

You know, if we can somehow have the NRC think about the wording a little bit better before it comes out and interface with their own PRA people, that would really reduce the amount of interaction required.

What's really happening is the industry is focusing in on the things that they see. Right? So that's important to them, but underlying that. Right? We see, you know, the operator requirements, for example, operator training and certification.

That all seemed to be very good. But underlying that's human factors engineering stuff I referred to earlier. Nobody's focusing on that because that's a smaller piece of the pie than what we're worried about and eventually we'll have to talk about these other things that we haven't yet had

discussion on that may be underlying like the number of the fire brigade for a fire protection program and the underlying deterministic fire protection requirements for suppression and detection and all that.

And then how do you risk inform all that? So I think it's just, you know, at least foresee further delays because of that amount of interaction is the only problem.

But the underlying process, I think we have to go through it. It's just to get to where we want to go, I think we have to go through it.

MS. VEIL: Thank you. Darren?

MR. GALE: Yes. So to Dennis' point, I would tell you that I don't think it's the processes that make it slow, it's just that this is hard. What we're trying to do is hard.

And it's not going to be just simple and quick that we get through this so the reason everyone's commenting on it because it is difficult and there's a lot of different things that we have to consider.

We're going to make it technology inclusive, you have to have it very broadly based and

flexible to it. So again, yes, it's going to make it longer than previously when the NRC was just, you know, focusing themselves in creating the language and then just letting us comment on the language, but I would tell you that I think it's just hard.

It's long because it's hard to do, not that we've got the wrong process going. That's what I would say.

MS. VEIL: And I don't see hands up so I would add here too that I think the value in doing this the way we've done it so early, this is an unbiased opinion, is that a lot of these really difficult issues are put on the table early.

So you can iterate on the issues and there has been change, there's been significant change that has come about because of this iterative process. And just imagining having all of that and one, you know, submittal and then trying to resolve all of those issues in a public comment period.

It would just kind of prolong it at that point while we're taking the time up front to really kind of dig into some of these issues, I think is the value. And I see Ed's hand up.

MR. LYMAN: Yes, since I raised this in

the first place, I won't say too much, but there were more than one occasion I saw process where the staff came out with a proposal, they were criticized by a number of industry stakeholders, they went back and thought they changed it to accommodate what they heard and then the industry attacked it again.

And maybe even criticized why they were making the change in the first place even though they suggested it. So it seems like there was some going in circles at one point which is one thing I'd flag.

MS. VEIL: Thank you. Let's see, this question is for Dennis. Risk informed is a blend of risk insights with the deterministic insights. Isn't what you're talking about, discarding deterministic requirements, risk-based?

MR. HENNEKE: I'm not sure I would use the word discarding deterministic requirements, but risk informed is using what is results risk information along with a deterministic overlay which includes defense depth and safety margins.

So regardless of what your PRA said, you still have a safety analysis and you still have a safety case to be made. And then, when again, you don't have risk information and risk results and you

have deterministic, you go with a deterministic set of criteria.

So we would never discard deterministic criteria. We may, per se, we may, if we can demonstrate the risk is sufficiently low with margin and with adequate defense in depth, then we may remove requirements, for example, for determination to be safety related, they may be still present, but not safety related.

So hopefully that explains this. It depends on the application of risk informed as far as what you're doing, but for risk informed licensing, we still have deterministic requirements there in the area of defense net.

MS. VEIL: All right, thank you. The next question is for me. Does the advance reactor GEIS being developed by NRC require any revisions, additions and response to recent Commission decision to require a revised GEIS for subsequent license renewal review?

And no, the advance reactor GEIS that's before the Commission now, the staff was not planning on making any changes at this time. We're waiting Commission direction, but it is before the Commission

now.

Okay, Dennis, you're very popular. There's another question. I'm going to start skipping around because a lot of them are for you, Dennis, but I'm going to ask this one now.

How does the proposed Part 53 compare with risk-informed licensing used or proposed in other countries?

MR. HENNEKE: Sure, yes, appreciate it, Andrea. This is a great question and if you could, if folks can understand this, the answer to this, they can, a lot of progress can be made overall and let me explain.

You, Andrea, you mentioned the Canadian work on the BWRX-300 right now is being licensed first at the Darlington site in Canada and then proposed as one of the possible plants to be put at the TVA site.

And so it's going to be licensed under CNSC requirements which apply IAEA guidance and which and safety requirements. The IAEA guidance is already and has been for some time, risk informed.

And from the, again, keeping my safety analysis hat on, the requirements really are to develop your licensing basis events which determine

your design basis accident evaluation and beyond design basis accident evaluation.

That can be risk informed using the PRA and then the levels of defense that are used determine what responses design-basis accidents can be risk informed. And the only thing that the IAEA has not done is go to the third stage of licensing modernization and that is safety classification.

Safety classification for LMP initially comes from the recommendation from the quantification of PRA and then you go through a separate process which overlays deterministic requirements to what comes out of the safety analysis and goes through an independent decision-making panel.

And eventually you end up with a larger group of what=s safety related and what's non-safety related pretty much. So that last part, that safety classification under the IAEA approach, is not allowed under IAEA, current IAEA methods although they're working on it.

What is stronger for the IAEA and we've mentioned a number of times is the defenses. It has a more formal defense level of one through five approach which is a systematic way to describe your

safety case with regard to defense in depth which currently is not under any of the NRC proposed approaches.

Now the, we mention that in our, the NEI letter, you know, the so-called IAEA approach, but to me when we look at the defense level approach for the IAEA, it's much stronger defense in depth of systematic defense in depth approach than what's currently under the current reactor fleet.

And we are looking also at that plan of defense level to the NATRIUM plant because it just provides such a strong safety case for defense in depth. But thanks.

MS. VEIL: Thank you, Dennis. And before we move on to the next question which is for Ed, could we get the results of the last polling question displayed?

And then for Ed, you noted the uncertainties associated with the proposed Part 53 so should we conclude that you may have a preference for one of the other current processes, Part 50 or Part 52?

MR. LYMAN: Yes, so clearly, you know, the current processes are not perfect. They're a

historical grab bag of stuff and certainly trying to come up with a new framework that's more in a consistent overall is not a bad idea.

And going back to the Fukushima Lessons Learned Task Force, there were a lot of issues with the regulatory framework that were pointed out then. But the Commission decided that there was nothing wrong with the regulatory framework.

Yet a few years later, they decided that they needed to transform everything including the reactor licensing so I do think actually looking back at Part 50, I think there's already a lot of flexibility in the rule that maybe is not completely, is not appreciated.

Certainly, there are light water reactor specific requirements. Those can be pretty easily dealt with so I thought instead of actually developing a new Part 53, where it's going to be a heavy lift to try to figure out how it corresponds to the current safety basis, that maybe you could deal with non-light water reactor designs through appendices to Part 50 and 52.

In other words, let the staff do the exercise of determining, you know, how safety

functions will translate into these other designs and, you know, the actual menagerie of advance reactors is not really that big.

If you think of it as just a combination of a few different coolant types, few materials and spectrum, neutron spectrum and so it seems like that's a finite problem that could be solved within the existing framework rather than throwing everything out and starting over.

MS. VEIL: Thank you, Ed. And we do have time for one more question. And this is just directed to whoever wants to respond and then we'll go back to the results of the polling question. There are about 40 reactors used in non-electric applications.

It increases about 15 percent in efficiency and that should be encouraged for industrial applications to help reduction in carbon and reduce energy costs.

Did anybody want to comment on that? And I can start by saying as a regulator, we don't have a role in encouraging any type of technology over another, any type of application, but we're just trying to make sure Part 53 supports whatever non-

traditional technology is out there, hence, the technology inclusive. Any comments? I see Dennis.

MR. HENNEKE: Well, literal hand raised.

MS. VEIL: Yes, both. Redundancy. If that's an --.

MR. HENNEKE: Yes, I mentioned earlier the natrium, the approach for using molten salt to store things so that we can run a higher power level during the day and then dependent on the amount of molten salt you store and the size of your total net weight, you could get quite a bit more power or say 50 percent more power during the day than there are at times when the load at the grid is much higher.

And overall if you look at the carbon reduction for that approach, if you look at the plants that are running for peak power loads, these are generally from, in the U.S. especially, these are your worst polluters. These are your worst CO2 emitters. Right?

We're trying to run natural gas plants which are still barred CO2 emitters, but not as bad as some of the coal fire plants and other oil plants and the other types of plants that are running out there.

So the carbon reduction for a load following the nuclear plant, that type, is probably 30 percent better than a similar plant that's a base load plant.

So I think that, you know, that a lot of people talk about innovation, I don't know if Part 53 gives us so much innovation, but the industry is thinking about these sorts of things, about carbon reduction, trying to think about how we can reduce the carbon footprint even more from just adding a whole series of base load plants.

And I think the industry is going to find ways to do this and the Part 53 really needs to be ready to be able to facilitate that because these are all great ideas, you know, and natrium plant is one of several great ideas out there for reducing the carbon footprint.

MS. VEIL: Thank you. Darren?

MR. GALE: Yes, to further Dennis' point, when you think about a high temperature gas cooled reactor furnace and so the load follow capability of a plant like this is very significant.

So you know, what a typical light water reactor, when you change the power, you typically

have a pretty significant change in the temperature in the components in the reactor itself. Right?

You're going to be changing the, and that's why it's so difficult on the fuel and difficult on the reactor itself to be changing power constantly.

Well, in a high temperature gas cooled reactor, it's literally just simply the mass flow of the healing itself so you really don't change the temperature or the conditions in the reactors itself with the change in power.

So, you know, it's almost like a, you know, it's a race car type of change and, you know, being able to load follow when you compare it to the typical light water fleet that we have now.

So with that, with advanced reactors, one of the things you're typically, you know, you're definitely looking for is the ability to, as Dennis says, replace this load following portion of the fleet now and electricity.

And electricity generation anyway and so Part 53 taking that into account in how we are addressing those reactors that are going to be focusing on those types of operations.

Being able to load follow and you would be able to do that, you know, in a much more quick fashion than you would have done with the typical light water reactors.

So Part 53 is going to have to have the flexibility to be able to deal with that, with those types of reactors.

MS. VEIL: Thank you, Darren. And if we could have the results for polling question three which is future focused. So we talked about what would you like to see more stakeholder engagement on.

And it looks overwhelmingly that experience with piloting risk informed licensing, approaches at 58 percent. Twenty-nine percent is flexible options for licensing, four percent is how to get more involved with Part 53 and 10 percent is the rulemaking process.

So we'll take this result into consideration as we do our continued public meetings, future sessions like this, like the RIC and other sessions. And I thank you for participating in all of the polling as we've gone throughout this session.

Could we have slide four please? Slide four is going to tell you more information about how

to get more involved in the rulemaking activity and we have a website.

The link is shown on the slide there. The public comment period, the official public comment period has been extended to August 31st, 2022.

You can submit comments on regulations.gov under the docket shown there. And for further information, you can contact Robert Bell, and his contact information is available on the slide here.

Before we end today's session, I would just like to thank everyone for your attendance and in particular, our panelists. I know you're all very busy.

The audience participation through live polling and your thoughtful questions was much appreciated. I'd also like to thank our session coordinators, Amy Cubbage and Steve Philpott.

We could not have done this without them. It takes a lot to do a RIC and in particular a technical session. And I also hope that the folks that answered polling question one that they've heard of Part 53, but didn't have a lot of background, you

know is more educated.

We had diverse views here and we had a lot of interaction and discussion. So I hope that next time we do a poll like this those folks would take off in their knowledge of Part 53. And with that, our session is now closed and I'd like to thank all of you.

(Whereupon the above-entitled matter went off the record at 2:24 p.m.)