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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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FUTURE PLANT DESIGNS SUBCOMMITTEE

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MONDAY

JULY 20, 2020

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The Subcommittee met via Video Teleconference, at 9:30 a.m. EDT, Dennis Bley, Chairman, presiding.

COMMITTEE MEMBERS:

DENNIS BLEY, Chairman

RONALD G. BALLINGER, Member

CHARLES H. BROWN, JR., Member

VESNA B. DIMITRIJEVIC, Member

WALTER L. KIRCHNER, Member

JOSE MARCH-LEUBA, Member

DAVID A. PETTI, Member

JOY L. REMPE, Member

ACRS CONSULTANT:

MICHAEL CORRADINI

DESIGNATED FEDERAL OFFICIAL:

DEREK WIDMAYER

CHRISTOPHER BROWN

ALSO PRESENT:

RICHARD DENNING

ED LYMAN, Union of Concerned Scientists

SCOTT MOORE, NMSS

WILLIAM RECKLEY, NRR

JOHN SEGALA, NRR

MARTIN STUTZKE, NRR

P R O C E E D I N G S

9:35 a.m.

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

ACRS's members in attendance are Matt Sunseri, Joy Rempe, Ron Ballinger, Charlie Brown, Walt Kirchner, Dave Petti, Vesna Dimitrijevic and Jose March-Leuba. Also in attendance is our consultant Mike Corradini. Derek Widmayer, of the ACRS staff is the Designated Federal Official for this meeting. And Christopher Brown of the ACRS staff is the backup designated federal official. This is a Skype meeting and members are occasionally dropped off the web connection or lose their sound, as just happened. If that happens to me, Dr. Petti will seamlessly take control of this meeting until I return.

The purpose of today's meeting is to discuss the staff white paper entitled, Questions Supporting ACRS and Public Interactions on Developing a Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors. You may have noticed that our meeting was announced as 10 CFR Part 53.

That remains true. The rulemaking is required by the Nuclear Energy Innovation and Modernization Act, which directs the NRC to complete a rulemaking to establish a technology-inclusive regulatory framework for optional use, commercial, advanced, nuclear reactor applicants. Sorry, I lost my place.

This rulemaking is expected to create 10 CFR 53. In SECY 20-0032, the staff provided a rulemaking plan to the commission that included a request to eliminate the usual regulatory basis document. In its stead they plan extensive public outreach. The commission has not issued an SRM on the rulemaking plan, so information about Commissioner votes on the proposal are not yet public information.

This rulemaking is intimately related to several technical issues that have come before our committee in recent years, including NUREG-1860, which was originally known as the Technology-Neutral Framework. On that one, an Advanced Notice of Proposed Rulemaking was developed back in 2006, but was abandoned when the expected test application for a pebble bed reactor design failed to materialize. Also, the Next Generation Nuclear Plant White Papers, the staff vision and strategy for review of non-LWR applications, including implementation plans such as

Reg Guide 1.233, which endorses NEI 18-04. Functional containment performance criteria, emergency preparedness for SMRs and ONTs, population-related considerations and advanced computer code evaluations.

We have written letter reports on all of these precursor programs. The rulemaking will be the culmination of all that previous work. It's come upon us suddenly and I think many of us expected complete trials of the OMP before there would be an actual rulemaking. Back at our October 30, 2018, subcommittee meeting, there was spirited discussion about frequency consequence curves and their use, and some indication that the use and final form might evolve during trials. There were other areas of discussion as well, and I expect those to continue today.

One related issue for members, in several of our reports we urged the staff to develop guidance on mechanistic source terms. I am pleased to tell you that the staff is providing the committee with two documents. Derek will be delivering them to the subcommittee members later this week, and we expect to have a meeting to review them at some time in the future. Today, the subcommittee will gather information, analyze relevant issues and facts, and

formulate proposed positions and actions as appropriate. This matter is scheduled to be presented to the ACRS full committee at the October 2020 full committee meeting.

The ACRS was established by statute and is governed by the Federal Advisory Committee Act, FACA. NRC implements FACA in accordance with its regulations found in Title 10 of the Code of Federal Regulations Part VII. The committee can only speak through its published letter reports. We hold meetings to gather information and perform preparatory work that will support our deliberations at full committee meetings. The rules for participation in all ACRS meetings, including today's, were announced in the federal register on June 13, 2019.

The ACRS section of the US NRC public website provides our charter, bylaws, agendas, letter reports and full transcripts of all full and subcommittee meetings, including the slides presented there. The meeting notice and agenda for this meeting were posted. As stated in the federal register notice and the public meeting notice posted to the website, members of the public who desire to provide written or oral input to the subcommittee may do so, and should contact the designated federal official five days

prior to the meeting as practicable.

Today's meeting is open to the public attendance and we have received no written statements or requests to make an oral argument. We have also set aside ten minutes in the agenda for spontaneous comments from members of the public attending or listening to our meetings.

During the COVID pandemic today's meeting is being held over Skype for ACRS and NRC staff attendees. There is also a telephone bridge line allowing public participation over the phone.

A transcript of today's meeting is being kept, therefore, we request that meeting participants on the bridge line identify themselves when they are asked to speak, and to speak with sufficient clarity and volume so that they can be readily heard. At this time I ask attendees on Skype and on the bridge lines to keep their devices on mute to minimize disruptions, and unmute only when speaking.

We will now proceed with the meeting and I call upon Joe Segala, Chief of the Advanced Reactor Policy Branch of NRR, to make introductory remarks. Joe.

MEMBER SEGALA: Thank you, and good morning. I think a lot of my opening remarks you had

already gone over so I'll try to go quickly. We're here today to brief the ACRS on our plans to develop a new technology-inclusive, risk-informed performance-based regulation for advanced reactors, which we are calling 10 CFR Part 53, and to obtain insights and feedback from the ACRS subcommittee at the very early stages of developing this new framework. Although we are expecting to leverage our ongoing readiness activities for this new rule, we are starting with a clean slate in looking for new and innovative ways to regulate advanced reactors.

As background, back in 2017, we developed NRC's vision and strategy document and implementation action plans or IAPs for enhancing our readiness to effectively and efficiently review and regulate advanced reactors. The IAPs include near-term, mid-term and long-term activities.

The near-term IAP activities are divided into six strategies. Strategy one on training, two on computer codes, three on developing guidance, four on industry consensus codes and standards, five policy issues, and six, communications. The ACRS recommended at that time that NRC focus its near-term IAP activities on strategies three and five, which we have been doing. The mid and long-term IAPs included a new

activity to assess whether a new regulatory framework should be developed for advanced reactors. However, in January of 2019, the Nuclear Energy Innovation and Modernization Act, or NEIMA, was signed into law and required the NRC complete a technology-inclusive, risk-informed, performance-based regulation for advanced reactors by no later than the end of 2027.

As Dennis indicated, on April 2020, we issued the rulemaking plan in SECY 20-032, which is currently with the Commission. On July 13, we issued a draft white paper with questions to help facilitate discussions today with the ACRS on Part 53. We are planning for this meeting to be the first of many interactions with the ACRS on Part 53. In addition to discussing Part 53, we will also be briefing the ACRS today on Regulatory Guide 1.233, which was issued in June of 2020 and endorses the licensing modernization project or LMP methodology described in NEI 18-04, as one acceptable methodology for non-light water reactor designers to use to establish key parts of the licensing basis and content of applications. LMP focuses on identifying Licensing Basis Events, classifying structure systems and components, and ensuring adequate defense in depth. This briefing will include a discussion on how we disposition the

public comment received on the associated draft guide 1353.

As a follow-up to LMP we have started to engage during several public meetings with the southern led, NEI-coordinated and DOE-cost-shared, Technology-Inclusive Content of Application Project or TICAP. The purpose of TICAP is to provide guidance for developing the content of the specific portions of an application that are within the scope of the licensing modernization project.

Similar to what was done for LMP, five developers, General Electric, Hitachi, Westinghouse, Kairos, TerraPower and X-energy, have expressed interest in piloting TICAP starting in August of 2020. In addition, the NRC is leading the Advanced Reactor Content of Application Project, or ARCAP, which will provide technology-inclusive, risk-informed and performance-based application content guidance. ARCAP is broader and encompasses the industry-led TICAP project. ARCAP includes those portions of an application outside the scope of the licensing modernization project. We are planning to brief the ACRS on TICAP and ARCAP in the future, and will be working with the ACRS staff to schedule these meetings.

As Dennis also mentioned, we recently published two mechanistic source term reports: One from Sandia National Labs in January, and the other from Idaho National Labs on June 30th on our public website. They provide guidance for determining technology-inclusive mechanistic source term for offsite dose assessments for advanced reactors. These reports were developed in response to letters from the ACRS sent to the commission in 2018 and 2019 on the licensing modernization project and our emergency preparedness for SMRs and other new technologies rulemaking where the ACRS expressed the importance of the staff developing guidance on how source terms should be developed.

And so we are prepared to support future briefings on these reports of the ACRS. We are looking forward to hearing from the ACRS today on Part 53, and any insights and feedback you all may have. We expect that these activities will result in additional interactions with the subcommittee over the next year or so. This completes my opening remarks. Thank you.

CHAIR BLEY: Thanks, John. I'm sorry I misstated your name, to begin with. I guess we're now going to Bill Reckley, is that right?

MR. RECKLEY: Yes, Dennis. This is Bill.

CHAIR BLEY: All right, go ahead.

MR. RECKLEY: Okay, as Dr. Bley and John mentioned, before we get into the discussions of our development of Part 53, we wanted to provide an update on our issuance of Reg Guide 1.233. Going to slide two, as was mentioned, our first detailed interactions with the ACRS, it actually started before September 2018, but in September 2018, we developed kind of the complete package to bring before the ACRS and subsequently the Commission and the public, with a coordinated effort that involved issuance of what was then draft revision N of NEI 18-04, the industry guidance document. The staff had prepared Draft Regulatory Guide 1353 and we also presented to the ACRS a draft commission paper because we thought some of the matters that were involved in this methodology warranted Commission consideration.

Ultimately, we had a subcommittee meeting in October and that was followed by the full committee meeting in February 2019, and ACRS issued its letter generally supportive of the methodology in March 2019. Going on to slide three.

CHAIR BLEY: Bill?

MR. RECKLEY: Yes, sir.

CHAIR BLEY: Just a quick comment for you guys. As we move from testing an approach to an actual rulemaking, I think we need to look for gaps, and some areas have come up in our discussions about recent submittals on particular projects, that reminded us that especially when you have new designs and designs that might have multiple hazards and things for which we don't have 50 years of history to help us out, when one looks for initiating events in the scenarios that follow them, you need something very creative, and you have to start kind of from a blank sheet of paper, and some kind of systematic ways to look.

That idea, isn't really laid out in your SECYs or the Reg Guide, or in the NEI document. They're hinted at as the main PRA standard. I'm not certain where the non-LWR standard actually stands right now, or I don't remember the details there. So I'm not sure that area is well covered and we're going to be pushing on that a little bit as we go forward. So go ahead.

MR. RECKLEY: Okay, thank you. And I think that would be fully appropriate. So with that background, moving on then to slide three, and catching up on what happened after our interactions

with the ACRS. So the ACRS letter was in March of 2019. We issued DG-1353 for public comment in April. We did receive one public comment from Drs. Denning and Mubayi, and we'll talk about that comment in the next couple slides.

For various reasons, NEI went ahead and issued Revision 1 in August of 2019. After some internal delays we ultimately issued SECY-19-0117 in December of 2019, to get the issues before the commission. The commission's Staff Requirements Memorandum was issued in May of 2020, and that, again, was generally supportive of proceeding down the path we had recommended. And we issued Reg Guide 1.233 in June of this year, June 2020. Based on the discussions that there were minimal changes to NEI 18-04 and minimal changes to Reg Guide 1.233 from the drafts, we requested, and ACRS agreed not to do further review.

Onto slide four, on the public comment, I view the comment to kind of be in two different, but, closely related issues. The first is on the actual frequency consequence curve, Dr. Denning observed that the use of a complementary cumulative distribution function would enable applicants, designers, and the staff, to see the contributions of event sequences to

the integral risk since the CCDF, the complementary cumulative distribution function is a way to look at the integration of the risks.

The other part of the concern, again somewhat related, is that looking as licensing modernization project does in the NEI-18-04 and Reg Guide 1.233, at individual event sequences and making judgments on individual event sequences, that process might introduce variability and flexibility to analysts that would change where the event sequence was plotted in terms of frequency, and that might bring up an issue of, again, variability between analysts, or even the ability to continually subdivide event sequences in order to try to reduce the estimate of the event frequency. So we looked at that comment.

MEMBER KIRCHNER: I'm sorry, John. Bill? I'm sorry, John,

CHAIR BLEY: Mr. Kirchner?

MEMBER KIRCHNER: Yes, sorry, Dennis, this is Walt Kirchner. May I ask a question of Bill?

CHAIR BLEY: Sure.

MEMBER KIRCHNER: Bill, just for the record, would you - I think I get it, but would you define what a complementary cumulative distribution function is in this situation?

MR. RECKLEY: I'll give it an attempt and then Marty Stutzke, if you're on the line, please come to my rescue through the phone-a-friend option here. But I think the public comment included this figure, which I think is a good way to consider how that would be used. Now this is plotting two different licensing basis event plots. One in red, and I'm on slide 11 as a backup slide. One in red for the first event, and one in blue for the second event, and you can see the contributions of the uncertainties as you plot that over both frequency and consequence. The licensing modernization project, NEI 18-04 methodology would look - if those events were not part of the same family, might look at those two events separately for comparison to the frequency consequence target.

The complementary cumulative distribution function would also look at them individually, but also integrate those two events and all of the other licensing basis events to give you the black line which would give you the integrated risk for all the LBEs. Marty, if you're on, can you maybe go a little deeper?

MR. STUTSKE: Yeah, Bill, this is Marty. Can you hear me?

MR. RECKLEY: Yes, thank you.

MR. STUTSKE: Yeah, this is Marty Stutske, I'm the senior technical advisor for PRA in NRR DANU. The frequency consequence target used in the LMP is nothing more than a scatterplot of PRA results where the x-axis being the consequence, and the y-axis being the frequency. So it's true, you're comparing individual sequences against the limit line up there.

In contrast, a complementary cumulative distribution function, the y-axis becomes an exceedance frequency. So what you do then, is you pick a consequence and you say what is the frequency of the sum of the frequencies of all of the sequences that have a consequence greater than or equal to your x-axis value.

MR. CORRADINI: Marty? Marty?

MR. STUTSKE: Yes.

MR. CORRADINI: So I guess, I think I understood why the y-axis is different. This is Corradini. But I'm confused as to why there is a series of points for any one LBE. I thought, unless this is a uncertainty example for the red and the blue line, but isn't there for a given LBE, an estimate of a frequency and an estimate of a consequence? Or why is it a family of points?

MR. STUTSKE: Okay, yeah, let me be clear.

You're right. There should be one dot for each event sequence family.

MR. CORRADINI: Okay.

MR. STUTSKE: With a consequence and a frequency. So when you take the entire PRA results, it's however many event sequence families you have is the number of dots on the graph.

MR. CORRADINI: So why are the red and the blue showing six dots for every LBE? That's what I didn't understand with this.

MEMBER KIRCHNER: I think, Mike, it's multiple, within a family of events that are similar, it's multiple events. That was my takeaway from this.

MR. STUTSKE: Oh, so this is not one LBE, this is a family of sequences.

MEMBER KIRCHNER: That's what I think. I don't know what poly means on the graph, but that was my sense. You got one set of events that are similar and you look at them and you get a curve from each individual event.

MR. CORRADINI: Okay.

MEMBER REMPE: So when we, like, this --

CHAIR BLEY: Richard Denning is on the line, he can clarify it.

MR. DENNING: Can I clarify that? Is it

okay if I clarify? So if you interpret the former curve there as a limit on the complementary cumulative distribution function, it limits risk. That is, if you integrate the curve against the y-axis, it identically tells you what the total risk is. In the interpretation that is in NEI 18-04, you don't limit risk. You could, for example, have at one rem, you could have a thousand sequences that each individually satisfied the one rem, and would clearly have an unacceptable risk. Okay?

Whereas, if you interpret it on the complementary cumulative distribution function, you actually limit the risk. Okay, you don't have this ambiguity of where you could look at it, at a LOCA, for example, and divide it if you wanted it to, into five different kinds of LOCAs. If you've got to consider a single point you also must consider, as is done in NEI 18-04, you also have to consider some uncertainty about that, right? Because we don't know, in any event, you have to consider what's the variability or uncertainty, and we will get into that in detail.

So what's done here with a complementary cumulative distribution function is you consider an uncertain distribution around a particular kind of

event like LOCAs, okay, and then you also, in order to satisfy a level of risk, you then develop the complementary cumulative distribution functions for the total. And that's what that dashed black line is. So you know that you have limited the risk of all of the LBEs by taking into account the complementary cumulative distribution function.

MR. MOORE: Excuse me, excuse me. I think Member Rempe has been trying to say something.

MEMBER REMPE: Well, thank you, Scott. When we discussed this with Karl Fleming, my understanding is that if you had two sequences that are 10 rem, or a 10 rem and a 12 rem in the group, the analyst is obligated to pick the 12 rem, and then multiply the frequency by two, so you eliminate the gaming that could be performed by the analyst.

This has been discussed in some of our prior meetings, and you are supposed to consider uncertainty distributions in the consequences, as well as the frequency, if you're going to accurately apply this. And Dennis, maybe you can speak up too, but we have mentioned this concern about gaming in the prior discussions. Now, what I don't remember, and maybe Bill Reckley or Marty Stutzke can tell me too is, did that concern get put into the final documentation?

Because this is not a new problem.

MR. RECKLEY: There's not a specific mention except for referencing the ASME/ANS non-Light Water Reactor PRA standard that talks about the processes to be used. You're right in that this particular issue has been talked about as part of NGNP, and even before that, as part of the methodology. The other thing that, going back to slide six, no, slide five, in our disposition, is that we don't want to come across the staking issue with the proposal in the public comment. The use of complementary cumulative distribution functions is a good idea, it's actually mentioned in the non-Light Water Reactor PRA standard as a methodology to look at cumulative risks and to make sure that, as Dr. Denning mentioned, you don't focus singly on specific event sequences, but you're also looking at the aggregate or total risk. That's handled within NEI 18-04, and the Reg Guide by including separate aggregate or cumulative risk measures against the NRC safety goals. For example, that's the primary one.

That's a way to do it to also make sure that you don't forget about the total risk. So there would be advantages to using the CCDF. We looked for, going on to slide six, one has to consider what the

methodology was actually developed to do. In the context of the Reg Guide we try to make clear that, actually, even the target figure, the frequency consequence target doesn't correspond to regulatory limits. It is instead a tool that would help us do the primary objectives of this methodology, which is to identify the event sequences. This may go a little bit to what you were mentioning earlier, Dr. Bley, of whether there's enough guidance on how you identify, and especially how you look at various, you know, internal and external hazards. But we can have that discussion as we go forward.

The methodology also, by looking at the margins, and the impact of assuming various failures, supports looking at the safety classification and the performance criteria that would be set up for both safety-related and non-safety related with special treatment structure systems and components. And then it supports a general evaluation of defense in depth.

Getting to Dr. Rempke's issue about looking at event sequences and trying to make sure that one would not game the system, if you will, we do look, you have to look at the methodology and how it's used. It has an emphasis on function and system level evaluation. So that provides a certain degree of

comfort. You also have the various reviews that would be done as part of the PRA standard. The reviews of the applicant and the designers themselves and then the reviews by the NRC.

For those reasons, the staff continues to think that the methodology described in 1353 and subsequently the Reg Guide, is one acceptable way. Going to the back of --

CHAIR BLEY: Bill? Bill? This is Dennis. Let me jump in a second. I'd like to summarize a couple things if I can, and then have you go ahead. Kind of everybody who's spoken is right, and I want to thank our former member, Rich Denning, for coming in on the meeting today, I appreciate it. And I mentioned that the coauthor of his comments, Vinod Mubayi, was one of the primary authors of this area in NUREG-1860, so well qualified. I think most PRA practitioners, you know, they're generating a CCDF at the end which is, as Marty well-described, an exceedance plot which summarizes the overall results, and, of course, that's a good measure.

I was reasonably comfortable with what was proposed in the NEI document and that the staff has supported because it does have this fallback of an integrated risk measure included. So the idea is

covered, and back to Joy and her discussion of Karl Fleming's area. I think this is an area where if this is going to become a rule then the guidance probably needs to be clarified a little better on this idea of families to avoid the problem. That's a problem that's kind of everywhere, and looking at PRA results, one has to be careful to understand how those scenarios have been broken down. But maybe the guidance there could be cleaned up a little bit. I think at this point, Bill, go ahead. You've got your actual target curve up here.

MR. RECKLEY: Well, and we can use it for questions. I was just going to make one last comment on the concern about frequencies and being able to potentially, continually try to subdivide in order to lower a frequency. And this is a practical observation. It's not really built in, necessarily to the process as a counter to that but just for the committee members to be aware, our expectation is that most designers are going to adopt a design objective of making sure that all the design basis events and beyond design basis events, don't exceed one rem or some other measure in order to take advantage of things like the Emergency Planning Zone Rule or the siting, the population-related siting paper that we

brought to the committee a little while ago.

And so as you as make that line a straight line at one rem, or again, some other measure if we pick it up, but it also is kind of a guard against just trying to lower the thresholds. Again, it's not a perfect system, but it is just a practical limit that you don't gain very much by lowering your frequency of all of the frequencies from 10 to the minus 2 all the way down to the lower threshold is using the same consequence measure of one rem. I just want to make that observation.

So again, we did appreciate the comment and again, from the staff's viewpoint we were presented with a methodology and asked to make a determination of whether that methodology was good enough. It wasn't a decision as to whether there could have been things that could be added. My own observation is that if we were to pick up CCDF, again, it would be most likely in addition to the methodology, and as we said, it might be a very good addition. It's already mentioned in the PRA standard as a way to look at the cumulative risk.

But in order to do the other objectives of identifying the events and safety classification, you would probably also be looking at individual events

using the same curve or a different curve. If we went down this route we would have to make all of those decisions, but the decision we were asked to make was whether what was proposed in NEI 18-04 was a workable methodology, and we think that it is, and that's what we reflected in our disposition of the comment.

Just in terms of updating, the last slide here is just the Commission SRM on SECY-19-0117. We'll get into this discussion also a little bit in the Part 53 topic we're about to pick up, but the commission generally endorsed this, and then also reminded us in that last paragraph that the safety goals and other established commission policies and regulations related to safety and risk metrics are applicable to advanced reactor in general, and then how we would build that into the framework.

CHAIR BLEY: Thanks, Bill. This is Dennis again. Two things, one I got knocked off the Skype meeting for about a minute, which is okay, Dave probably didn't even notice that happened. I appreciate we've had a good discussion on this, and I wanted to let that go as much as we could. At the end of this meeting I'm going to ask the members to consider whether we want to or need to have that October full committee meeting. And I think the real

key to that is if we want to write a letter since all but one of us is attending today. So keep that in your minds for the end of your meeting. There are a few of these issues that we might want to give a heads-up early on, and that would be the only point, and to let the commission know we're following this. Please continue. Thanks.

MR. RECKLEY: Okay. So kind of along that path, and switching topics a little bit, using slide eight, just to talk about some of the future interactions and getting to what Dennis was mentioning. There's a fair number of topics on here, so we will have to coordinate our interactions with the ACRS and then when ACRS responds via letter, would be appropriate. And when we get into Part 53, I think we have some flexibility, but whatever would be the most useful we can decide during that discussion.

So just going quickly, you're aware there are design-specific applications that the ACRS will need to weigh in on, and some others that they'll be given the option to weigh in on, things like topical reports. The remaining discussions today will be on Part 53. As Dr. Bley mentioned, we did commission a couple reports on mechanistic source term, and once you have an opportunity to read those we can decide

what interactions would be requested.

I'll give you a warning ahead of time, these are fairly high level discussions. Although they might include examples of technologies, the two reports we provided were not aimed at how do you develop a mechanistic source term for a reactor technology of x, y, or z. It was a kind of high-level process for what needs to go into developing source terms.

CHAIR BLEY: Bill? Excuse me. The last indication we had was that you are also developing a Reg Guide related to this. Is that still true?

MR. RECKLEY: I'll let John weigh in. At this point we may as we go further down and see what the reaction is to these reports and whether it warrants going to the next step of issuing an actual Regulatory Guide, or if we start to look at individual technologies, whether it makes more sense to have a Regulatory Guide that would follow up.

We also have some technology-specific reports. Oak Ridge is doing some work, Molten Salts, Argonne and Idaho on fast reactors and gas-cooled reactors. So one of the discussions maybe we could have during a committee meeting is where would regulatory guidance in the form of a Reg Guide

actually be the most useful.

CHAIR BLEY: Okay, thanks, yeah, we'll look forward to pursuing that with you. Go ahead. Well, before you go to your next bullet, John introduced the next bullet, and if you can say a little more about what you're talking about here with this TICAP thing, I'd appreciate it.

MR. RECKLEY: Sure. Okay, so we mentioned in Reg Guide 1.233, kind of as a predictor, that we will need additional guidance. At this point we have two Reg Guides specifically for advanced reactors, and one of the ones that we thought would be useful is to go into more detail on actually what goes into an application.

So that is the content of applications discussion. We've broken that into two parts. The first part is the unplanned event portion of an application. So if you think traditionally, this would be FSAR Chapters 15, the safety analysis. Chapter 19, the PRA assessments, as well as the discussions of individual systems and their roles in addressing those unplanned events. Also some of the work in the early FSAR chapters on hazards, external hazard assessments, for example.

So the unplanned event portions of an

application is what is included in TICAP, and it's a significant part of a safety analysis report. We are working with kind of a coordinated effort that's similar to licensing modernization, as John mentioned. There's a DOE-cost-shared initiative with industry, and we expect to get a guidance document from NEI that would take and build upon NEI 18-04 to say, from that methodology, this is how you transfer it into a FSAR. One example would be a safety-related system would get this amount of detail in a discussion. This is what would need to be described for a non-safety-related with special treatment kind of SSC. This is how the performance criteria would be established and monitored, for example. So that's the TICAP portion.

MEMBER REMPE: Bill, this is Joy. Can I interrupt you?

MR. RECKLEY: Sure.

MEMBER REMPE: I was planning to bring this up in the next part of the discussion, but I can't resist here. When we first started doing this, most of us, as I had envisioned, you'd have reactor where you put fuel in it at the site, and then you take the fuel out and you, at some day dispose of the vessel or whatever. Nowadays we're talking about bringing a loaded core to the site, and maybe you do

a few things once you get there, but then after you run the reactor you take the loaded core someplace else.

Is your vision considering this not only for how you're going to select the licensing basis events, but also the content of the application? Because you might have more risk with this transportation issue than you do with the actual operation of a small modular reactor.

MR. RECKLEY: Yeah. And the next-to-the-last bullet on microreactor issues, for example, one of the things we'll have to do, and we'll have to work with industry on what is the content of their guidance under TICAP, and how far are they going to take it to address the issues that you just mentioned. If that's not picked up as part of that effort, we could pick it up in the subsequent discussion, which is things that we're putting under advanced reactor content to application, or issues that are not picked up with the unplanned event.

I don't believe that TICAP would probably pick up transportation, for example. So maybe we need to pick that up in advance reactor constant to applications. We may be able to take large advantage of existing guidance on transportation containers and

guidance and requirements, but we will have to make that assessment.

So this has a lot of moving parts, as you're hinting at, and exactly where any particular issue lands, we are still kind of working out and coordinating. But we do have them all on the radar screen.

MEMBER REMPE: Yeah, because even, you know, licensing basis event may not just be when the reactor is sitting there running, and so yeah, I think we need to broaden our perspective. And I'm glad to hear that the staff is thinking about it even if we don't have an answer yet.

MR. RECKLEY: Okay, thank you. And Walt? I think somebody?

MEMBER KIRCHNER: Yes, Bill, this is Walt. It would seem to me, Bill, one area that would in your guidance -- I'm seeking some clarity in the use of terminology. Let's start with safety-related versus non-safety-related or whatever, or not safety-related. For example, often we are presented in presentations from the staff, we have safety-related, not safety-related, and then important to safety, not important to safety. So sometimes that framework is used, and then sometimes what we hear is it's safety-related or

not safety-related, risk-significant, not risk-significant, and so on.

So given that this is more of a risk-informed approach, it seems to me some clarity is needed in terminology and definition so that when it comes time to break down, not the contents of the application, but the contents of the reactor design itself, and classify SSCs, I think this is going to be a real challenge for you going forward.

MR. RECKLEY: We agree. Actually, when we get into the Part 53 questions, one of them goes exactly to terminology because as you mention, within the existing Part 50 and 52, there are definitions. And those were clarified in various papers regarding important to safety, they were also then further enhanced under the passive reactors, and the introduction of RTNSS, Regulatory Treatment of Non-Safety Systems. And then 50.69 has its own categories that you mentioned that are based on risk significance. And you have all of that history under Part 50, and then what we ultimately did under Reg Guide 1.233 was introduce yet another set of terminology.

MEMBER KIRCHNER: I know. That's my concern.

MR. RECKLEY: Yes.

MEMBER KIRCHNER: I think clarity here is needed.

MR. RECKLEY: Right, and I think we've talked about this in our past interactions, was that that is a challenge. We're expecting under Reg Guide 1.233 that anybody that uses the methodology adopts the terminology out of NEI 18-04, but we do realize that sets up a different definition and a different discussion than maybe a similar design that would pick it up under Part 50. And we've tried, and I don't -- any suggestions would be appreciated.

CHAIR BLEY: This is Dennis again. Thinking about this TICAP and about Part 53 as well, Mike Corradini often says, you know, work the problem backwards. What's, you know, kind of to the old style, what's the worst thing that could happen to this? And you've got some documents that hinted that it would seem that the content of applications and the depth of applications ought to be linked to the worst -- kind of the worst things that could happen, especially when we start thinking about some of the microreactors, which I assume would be under this same umbrella, so there needs to be some kind of scaling that's built in based on the kind of maximum source

term one would be dealing with. Is that part of what you're planning?

MR. RECKLEY: Yes, in that Reg Guide 1.233 mentions that people might want to take an approach like a maximum hypothetical accident approach. We have had some discussions with individual designers that are using or contemplating using that kind of approach. One of the things, and it's all related, as you mention, but maybe when you look at the mechanistic source term documents that if an applicant is able, or a designer is able to show that hazard just is not able to put the radionuclides on a path for release because they're retained within the fuel, or maybe the first and second barriers, we've said we're amenable to looking at those kind of approaches if they can demonstrate them. It might be a big if, but that's from a process-wise, we'd be open to it if they can show it. And that kind of approach is used, for example, in some of the research and test reactors.

MEMBER KIRCHNER: Bill, this Walt Kirchner again. On this topic, this is another area where I find some clarity is needed. Source term has different meanings for different people or applicants, I would guess as well.

The traditional source term if you're going through the 10 CFR 50 and 52 process, is to hypothesize a maximum creditable accident no matter what, and then use that as the quote-unquote "source term." Now any reactor that's operated by definition is going to have fission product inventory buildup. Depending on the fuel type used, that may be a hazard in and of itself without operation, et cetera.

So there is always, with any advanced reactor, or any micro-reactor, or any large reactor, there always is a hazard. There seems to be -- I think you're going to be presented with arguments that we don't have a source term. And when people say that they're thinking of 10 CFR 50 and 52. But clearly, any reactor that's operated, builds up fission products and hence presents a hazard, and that's what the NRC has to assure, the adequate protection of the public. So that it seems to me that you're going to run into a lot of arguments about source term.

MR. RECKLEY: Yes. And it's sometimes, as you mentioned, a terminology issue. They have an inventory, obviously, and I think maybe when you look through mechanistic source term papers you can see we're trying to get the discussion about where are the inventories and how are you controlling them or

inhibiting their release as being the topic, as opposed to, as we have for Light Water Reactor saying the source term is what is put into the containment and then model the containment for what is the public dose. So I think we'll continue to have some terminology challenge as we go through.

In general, for non-Lights, the source term as we're using it is actually what leaves the last physical barrier. In other words, if you're an analyst, what would you input into your atmospheric dispersion code? But again, that's different because we're now saying it's on the other side of the last wall, if you will.

MR. CORRADINI: Bill, is that any different than TID 18.444 and the original approach to Part 100? It's essentially the same thing.

MR. RECKLEY: Well, it's somewhat the same. It's just, again, it's largely in my view a terminology issue. The source term as it was defined in TID and NUREG-1465 is the radionuclides that are put into the containment, and that's what's called source term. And then you model it for what gets out of containment, and then you model it for how it's dispersed.

Since the role of a physical containment

structure might vary and as the discussion went, as Dr. Bley mentioned, one of the first papers we did was the functional containment paper, the source term as we use that term, is now the radionuclides that are past the last physical barrier.

MR. CORRADINI: Okay, good point. I'm sorry, you said it much more clearly.

MEMBER PETTI: So Bill, this is Dave Petti. It just seems that with all, even just the discussion among the committee here, that some sort of a document from NRC, some sort of guidance is necessary to help people understand what the rules of the road are. My view is there may be more than one way to get to a source term, to lay out, sort of, some options, but at least try to remove some of the confusion that could exist, but out of such guidance. I think there will always be questions, but I think without guidance you'll have even more and it will just take longer to, you know, to get everybody through the process.

MR. RECKLEY: Okay, thanks, Dave. And we'll finish this up and then move into Part 53, which will be another opportunity for us to try to clarify all of this. The other thing, and this is just an additional complication, is it will also matter what

you're doing that assessment for. And we may approach in the future where, from a licensing standpoint, you can do as Dennis mentioned, and have some very - try to avoid the term - but very conservative assumptions that would go in and basically say for licensing purposes we're taking a simplified approach because we think we can maintain the inventory or prevent the inventory from release, whereas if you're doing a more best estimate, an actual analysis, you may have to go into more detail.

And a designer might need to do that for other reasons, like occupational dose or economic reasons, to do more detailed assessments of where the radioactive material might end up or might present a challenge, even if you can show with high confidence that it's not going to get out of the facility. So this is all, you know, it's all a complicated endeavor on the part of both the designers and us to try to navigate.

MEMBER KIRCHNER: Bill, this is Walt Kirchner. Sorry for the frequent interruptions. No, I'm not sorry; I apologize. The one thing that was on one of your earlier view graphs and also you had presented in past meetings, I don't think on the tabletop exercises conducted today, people went

completely through the defense in depth part of the exercise. And I'm wondering what guidance you're going to provide to get out of one person's judgement versus another on what is sufficient defense and depth.

How are you going to generally kind of wrap that part of this up in terms of guidance? When is enough, enough? When is, for example, just no matter what, you know, we had a former member who would say I just want an essentially leak-tight containment, period. And that's, of course, also subject to definition, but you get my point that, you know, in the final analysis, you've done all this and so on, but defense in depth, when is enough, enough, and how do you decide that?

MR. RECKLEY: Right, and other than trying to follow through with the process that was laid out in NEI 18-04 and the Reg Guide, that's currently where we are. There is, as you mentioned, a certain subjective element to that, engineering judgment element to that, that will maintain.

How we decide when is enough, enough gets complicated because going back to the backup slide on slide ten, what we expect is that designers are going to come in and try to utilize the margins that are

available to them through the designs in order to get flexibility somewhere else, like emergency planning zones is the common example, or population related siting considerations we talked about a couple months ago. Or there will be something else.

The last bullet on future interactions is staffing.

CHAIR BLEY: If I might interrupt yet again. I think, Bill, the most challenging area where a designer will want to use margin is cutting down on the number of systems that are safety-related because there's an economic cost associated with that.

MR. RECKLEY: And we -- yes.

CHAIR BLEY: That's where I think you'll run into the problem, yes, on emergency planning and so on, but that one probably becomes where the designer first tries to use the margin that he or she believes they have versus the consequence curve, the frequency consequence curve.

MR. RECKLEY: Right. Yeah, and a lot of that will be -- within this methodology I think it provides the opportunity to hopefully give the designer the ability to come in and say, We're gonna add this system for defense and depth. The methodology as it stands would generally allow that to

be done without making it safety related. Go ahead, Dennis.

CHAIR BLEY: This is for Walt and others. This is a place where I felt NEI 18-04 made a good step beyond what was in 1860 15 years ago. They really laid out a structured approach for looking at the defense in depth issue and considering various different approaches to that. It's one area where, at least the last time we talked, the tabletops hadn't fully exercised this methodology, and I guess I'd sure like to see that at some point. This is an area we might dig into in a future meeting somehow.

MR. RECKLEY: Right, okay. The other part of it is we will see as it gets exercised, and that will be where we need to remain agile enough to see that some of this work that's going on in parallel, if you keep track of it and incorporate any lessons, both from the application of this in designs like Kairos, and you guys were looking at some of those topical reports, or a different committee is, we're going to be watching how it's applied to the versatile test reactor. They're going to use this kind of methodology. So we will keep an eye on it.

Trying to finish this up, and all of this is a great discussion, and it feeds right into Part

53, that we're going to get into next so I don't think that we're really getting behind because a lot of this is the same discussion.

So I tried to explain what TICAP was, that's the unplanned events portions of a safety analysis report. There would be other guidance on other things outside of the final safety analysis report, sections on unplanned events, the normal effluents, for example, technical specifications.

There's some interest in additional guidance on what goes into a construction permit under Part 50 because it's been a long time since we've looked at a Part 50 construction permit, especially for a reactor design that's significantly different than large light waters. The next to the last bullet I mentioned.

There is a pending SECY paper on microreactor issues, and then out of that paper the gist is an information paper that identifies various issues, including the fact that micros might be deployed differently and might bring up issues like transportation and manufacturing even more so than what we've dealt with to date.

Out of that paper we expect other policy papers, and one that we're just beginning the

discussions internally, is on staffing, and questions like if a reactor can show inherent features, can those features negate the need for licensed operators. Would it be possible to go to autonomous operations either through digital systems or inherent mechanical, physical attributes, remote operations.

So all of these questions, we're just beginning to discuss what would go into a future paper on staffing, and it may be one or more of these issues, depending on the timing and the applications that we get in and the feedback we get from industry. So I guess all of this --

MEMBER REMPE: Bill, this is Joy.

MR. RECKLEY: Yeah?

MEMBER REMPE: And I didn't interrupt you when I wanted to about the construction permit application, and what's required. You do have an ongoing effort with the SHINE Medical Isotopes effort, and there's a lot of coordination going on in the staff because I think that's a good example that could shed some light.

MR. RECKLEY: There is, and I'm sorry I should have mentioned that. Yeah, we're looking very closely at what was done to issue that construction permit and then as they enter the next phase, how you

go from the construction permit review, over to the operating license review. So thank you. Yes?

MEMBER REMPE: Thanks.

MR. RECKLEY: So the Part 53 discussions in a different slide presentation, Dennis, are we ready to jump into that one?

CHAIR BLEY: It's not. I'm going to call a break at this point, and I think you're right. I think we've made a lot of progress through some of the, at least background material, and even some of the questions in the Part 53 discussion. Maybe when we start there you can go through the first few slides pretty quickly because I think you already talked about many of them.

Let's take a break. It's ten 'til. Let's come back at ten after. What will that be back east? That will be ten after 9:00 here. Ten after 11:00 east coast time. And we'll go right through, and if we need it, we might take after an hour, we might take a short five or ten minute break then before we finish up.

So at this point we'll take a break. When we come back we'll be on the next slide set. If we can get those set up ahead of time. I'll see you back here at ten after.

(Whereupon, the above-entitled matter went off the record at 10:49 a.m. and resumed at 11:10 a.m.)

CHAIR BLEY: Okay. It's 10 minutes after, we're ready to start again. Bill, will you be going ahead or will it be by Bill?

MR. RECKLEY: This is Bill Reckley. I'll continue.

CHAIR BLEY: Okay. You're up.

MR. RECKLEY: Okay. Thank you. So as we mentioned, some of this I can go through relatively quickly because we talked about it in the last part, including the background. We have considered rulemakings in the past as has been mentioned, the Nuclear Energy Innovation and Modernization Act directed us to do a rulemaking and to have it completed no later than December 2027.

To schedule, as Dennis mentioned in the introduction, we don't have a Staff Requirements Memorandum yet. We are aware, and the interaction with Senator Barrasso is a public record that at least a number of senators expressed a desire for us to speed it up. And the Commission in the response said they would give direction to the NRC staff on a schedule. So 2027 is the latest schedule. One should

not be surprised if we get some encouragement to go quicker.

I'll go into that, as Dennis mentioned, maybe with ACRS interactions in a couple slides. One of the things we maybe didn't talk about under NEIMA is their definitions, so on Slide 3, these have come out of the act. Advanced reactors means a nuclear vision or fusion reactor, including a prototype plant that has significant improvements. And then the act lists those in terms of proliferation-resistance, risk, economics, fuel, and a number of attributes that would be an improvement over existing plants, or plants that were under construction.

So our working scope with this then is light water small modular reactors, non light water reactors, and fusion reactors.

MEMBER PETTI: So Bill, can I ask you a question? What are you going to do about fusion?

MR. RECKLEY: There's two thoughts currently. And it's as good a place as any to talk about it because I don't talk about fusion too much throughout the presentation. The first thought would be if you have a risk framework, can fusion actually just be treated like any other reactor?

Our initial thoughts are that because the

Atomic Energy Act spells out for production and utilization facilities and their use of special nuclear material, the Atomic Energy Act itself sets out a number of requirements that we would have to fulfill for fusion. And they may not all be needed. We're still assessing, but it may be that although fusion would be addressed through this rulemaking, that there is a distinction made between fusion reactors and those using special nuclear material with a thought that the fusion reactors, if it pans out, might be handled more like -- I won't say exactly like, but more like a materials licensee facilities like accelerators.

So we're still just thinking about that. We had planned a workshop with the Office of Science, Fusion Energy Sciences within DOE in March. And unfortunately, that was delayed because of the COVID. We're looking now to have a workshop or a public forum again with the Fusion Industry Association, DOE, other stakeholders in the September, October timeframe. We'll be talking about specifically developing a regulatory framework for fusion within this activity.

MEMBER PETTI: So Bill, back in the 90s I authored a DOE safety standard on fusion, and that DOE standard got -- you have to Google it, Safety of

Magnetic Fusion and Facilities or something.

MR. RECKLEY: Yeah.

MEMBER PETTI: I want to say DOE 6005.

MR. RECKLEY: Right.

MEMBER PETTI: The framework is very similar to LMP. We borrow it heavily from, at the time, it was through GA framework. The difference is in the details, right? The nature of the radioactive materials. It's a much more distributed system in terms of hazards because you're pumping tritium all over the place. So there are differences in terms of the details, but I think you probably can fit it in at the high level. You know, they had a frequency-consequence curve.

MR. RECKLEY: Right.

MEMBER PETTI: All of that sort of stuff. So it's just that when you, you know, the devil's in the details. It has to look at it in a different way. But I think there could be a lot of overlap in --

MR. RECKLEY: Yeah, I've looked at those and I think you're right. And the part of the discussion might be whether, again going back to the Atomic Energy Act and all it requires for facilities using special nuclear material, whether we would want to encumber fusion with all of those. It may be that

that's the easiest way to go. We haven't decided yet.

And then the other thing within fusion, I think most people are familiar with facilities like ITER, the big facility under construction in France, but we'll have to decide. Fusion has as many approaches because of the isotopes you're able to work with, and the size of the reactor that you might be working with. They are just as varied or maybe even more varied than fission reactors. And so if we're going to try to address all of those, it would be amenable to a risk informed approach like you're mentioning.

Then the other definition within NEIMA is for the regulatory framework and the technology-inclusive framework. Going down specifically to the rulemaking plan that we submitted to the commission in April, SECY-20-0032. And Dennis mentioned, our first proposal is to develop a new part. That provides us kind of an opportunity we think to as much as we can start with a clean slate and try to construct something that would be the best for a range of technologies.

The next slide, I'll just go to the -- well the last bullet on this slide is we're expecting extensive interactions with external stakeholders and

the advisory committee. And so as we get into this, and then hopefully at the end I'll try to go through this all relatively quickly. Most of this presentation is a list of 14 questions. I don't plan to spend a lot of time on each question.

We can go through them and maybe pick which ones might be of most interest. But I think the biggest thing to keep in mind is that this is one of those rare opportunities where we're starting relatively with a clean slate, and we're at the beginning of the process. So how we interact would be important.

When the ACRS would decide to send us recommendations, again, we can work that out. I would imagine you would especially want to do that if you thought we were going down the wrong path. So although the 14 questions read as if we are totally from a blank slate, we have given it a little thought. And we use this slide in public meetings to talk about how we thought part 53 might look. And the first part was kind of a decision, and we talk about this within the rulemaking plan.

NEIMA does define the framework primarily in terms of licensing. But our assessment was if we overly focused on the first step in the process, we're

both going to miss an opportunity. And two, it's just very difficult to talk about those first steps without having a good understanding of how the whole project life cycle fits together. And so the proposal in the rulemaking plan is that we go beyond licensing and we build a whole regulatory framework, not just a licensing framework, but a regulatory framework.

So how would that work? One of the key things would be to clearly define what are the highest level safety or risk metrics. So what are the fundamental safety functions, what are the metrics like the 5034 criteria of 25 rem over the course of the event at the low population zone. Like the NRC safety goals. How they get worked in in terms of risk metrics, the use of something similar to the frequency consequence targets. And this might be an opportunity to go to something more that would be like a limits exceedance factor.

With the emphasis we put before, remember that the frequency consequence targets, NEI 18-04, we have specifically said we are not able to correlate those to existing requirements because existing requirements weren't defined in those terms. And that turned out to be problematic throughout the Next Generation Nuclear Plant project. And so early on, we

decided in NEI 18-04 that we would ask, and the industry guidance document changed those from top level regulatory requirements to FC targets.

Well we're now going to be doing a rulemaking. If we were to decide to put a frequency-consequence figure in the rule, that could now then be a regulatory requirement, and you could use something like limit exceedance factors against that curve if we wanted to do that.

Then you would also have regulatory requirements just like we do now on normal l effluents. Those things that are in Part 20 and also for light water reactors in Appendix I to Part 50 on normal effluents. And then there'll be other factors that we have to define within the rules, or make sure other rules are there to identify.

So once you're able to define those actual risk metrics, safety metrics, the idea was that the rule would then look and say, "What is the role of the various parts of the lifecycle in meeting those requirements?" So at the highest level, the functional design, how are you looking at those performance metrics?

Then down to the system level, how are you making sure that individual systems are fulfilling the

metrics? How do you maintain that during construction? For example, what testing you do to make sure that the equipment actually has the capabilities that were intended to be built in at the functional or system level.

Then during operations, how are you doing configuration control, how are you doing surveillance and maintenance, how are you controlling design changes. And then ultimately, what needs to be done during retirement or decommissioning phase to maintain those requirements?

So all of this is currently within our framework for the operating fleet. It's just a matter of again starting with a clean slate. This is an opportunity to try to define the role of each one of these project lifecycle parts. And maybe importantly, the relationship of one part to another.

And those that have been around for a long time, including myself, much of Part 50 was really aimed at the, at least initially, at that functional and system level design requirements. TMI came back and reinforced some of the importance of operating, of those things that you do during planned operations. And then we did things like the maintenance rule and other things to better define the requirements during

operation.

But the thought is this is an opportunity to look at this as an integrated system. And in some cases, you may be able to benefit by knowing what is going to be required during operations in order for a designer, and just as importantly for us as the staff to say, "In terms of how deeply I look at a design, I can build into that logic what I know will be done during operations to maintain configuration to do surveillance and maintenance." So again, I'm not -- this is done now. We're just trying to lay it out a little bit from the very beginning.

CHAIR BLEY: Bill?

MR. RECKLEY: Yes, go ahead.

CHAIR BLEY: Two related questions. This is Dennis Bley. One, your discussion sounds like you already started a white paper on this. So first question is is that true, are we going to see something like that? And then the second question is if you decide to make Part 53 whole and not relay on Part 50 and Part 52, does your thinking lean toward having all of the approaches in 50 and 52? And by that I mean construction permits, early site permit, either a design cert and Combined License or an operating license. Are you thinking about including

all of those, or have you given all of that much thought yet?

MR. RECKLEY: Our working assumption is that we'll address all of those. And then it's just a sentence or two within the rulemaking plan. And then also see if there is something in addition that we might add.

In other words, we would plan at this point to support under Part 53 either the traditional two-step CP, construction permit operating license, or any of the combinations that are allowed under Part 52. And then we're also looking to see if there's anything in addition that we might be able to do beyond that.

MEMBER BROWN: Bill, this is Charlie Brown. Can you hear me?

MR. RECKLEY: Yes, sir.

MEMBER BROWN: Okay. Just an amplification of Dennis's question, or a backtrack maybe, under requirements definitions -- you open with that. That's how you kind of lead into this whole picture. Does that mean an examination of like all the general design criteria?

Just for information, since I'm a meaty guy as opposed to commercial guy, went through and

looked at all the GDCs yesterday. And a good bit of those are very, very generic. Does that mean a re-examination or a generation of a whole new class of general design criteria?

MR. RECKLEY: Excuse me. the general design criteria and then the advanced-reactor design criteria, developed under regulatory guide 1.232, are generally organized around the same fundamental safety functions that we talk about elsewhere. We talk about it in NEI 18-04. It's talked about in various NRC documents, even IAEA documents, talk about basically the fundamental safety functions as being the retention of the radionuclides. That's the ultimate goal.

And then the related safety functions such as controlling power level or reactivity, and controlling heat removal, sometimes also introduced as things like controlling chemical attack. That might be important for some design. So I think the notion would be there that we would define within these highest level requirements something analogous to the general design criteria.

It may be at that higher level because it's required to be technology-inclusive. So it might talk about the various sections that are now included

in the GDC. Which again, align generally with those three fundamental safety functions. But yes, there would be something there along those lines.

MEMBER REMPE: Bill? Charlie, are you done?

MEMBER BROWN: No. Can I finish the question?

MEMBER REMPE: Oh yeah, go ahead. I'm sorry. I didn't mean to interrupt.

MEMBER BROWN: No, that's okay. Thank you, Joy. You talked about them being a technology -- how did you phrase that when you answered me?

MR. RECKLEY: Well we use the phrase technology-inclusive.

MEMBER BROWN: Yeah. I looked at them from that standpoint and most of them fundamentally address the things you talk about, heat removal, boundaries, radiation requirements, et cetera. So they're pretty technology-inclusive as they are. And it sounds like what you're telling me is that Appendix A would be something all total new if you have an Appendix A.

I mean, that's what Appendix A is, is the GDCs fundamentally. So it sounds like you're thinking about generating a new Appendix A with however you

want to phrase it, with one through whatever they turn out to be. That's the way I got your answer. Is that right or wrong?

MR. RECKLEY: I'd say it's kind of early. But I'll just give you my thinking, was that we wouldn't have Appendix A. But this would be within the main body of the regulations. But again, that's largely format to me. Obviously Appendix A is an appendix, but it's one of the most important parts of Part 50.

So if you had rolled the GDC into, you know, and gave it a number instead of an appendix, it would be largely the same. But the level of detail and how far you go down in those system level requirements will be one of the things that we talk about. And again, we're just -- we're pretty much at the outlying stage at this point.

And I don't even want people to over think where we are right now because we're still open. We've been giving it a little thought because we had the time to do so. But as we'll get into the questions, we're really amenable to receiving suggestions that would propose something different to us.

CHAIR BLEY: I'd remind you of something

Bill sort of reminded you of. A couple years ago, or three, we went through the advanced-reactor design criteria and went through those same discussions. And that's probably where they're starting. I'd take one second to, you know, a couple seconds to fill in a little history. Because we thinking of tech specs and design criteria as always being there.

Originally, there were no such things and because people started getting construction permits and then coming in with designs that didn't quite meet the staff's expectations, these things developed to kind of warn people where they needed to go after the construction permit.

And then I think Joy had something she was trying to get in.

MEMBER REMPE: Yes. I actually like this figure as a layout. And I'm hoping that it's preliminary, but when I looked at it, this is where I wanted to bring up scope. I had already mentioned about transportation to and from the site. It seems like embedded in this figure is that you're only at the site.

So maybe you can think of a way to adjust it to consider that. The other thing is since you got the issue of retirement, waste generation comes in.

Dave mentioned fusion earlier today. My understanding is you get a lot more activated materials. Even the gas reactor, because of its low power density, has a lot more low level waste. But maybe we ought to start thinking of the whole lifecycle and what -- we might end up with some different thoughts about what might be of more concern with some of these designs.

And so have you thought about maybe modifying this figure, or are you open to maybe thinking about modifying it to more explicitly indicate to the public that you are considering some broader scope than what we have with the existing fleet?

MR. RECKLEY: Yeah, we would be amenable. And some of what you said -- again, we're kind of early in the process, but some of the things like the waste and the decommissioning, we currently have a rule -- and I'm going to, I forget the number -- under Part 20, that even as you do the initial design, you think through minimizing contamination to support decommissioning.

So that would be under normal ops and performance criteria or other over there in the purple box that we would need to put that in as the attention continues to increase on micro reactors. How this

fits in and either we incorporate things into this to support things like transportation or we at least have a good connection between the requirements here and then the requirements on the transportation side of our regulations.

And they would be different. Obviously when you roll a new micro reactor out of the factory, your concerns on the transportation will be different than when you retire it and need to transport it somewhere else. So yeah, we're amenable to any of these discussions. And really what we'll be looking for as we go through this is, in large part, make sure we don't miss anything within this framework.

MEMBER KIRCHNER: Bill, this is Walt Kirchner. I'd like to go back to Charlie's observation and concur. And to just point out that rather than relegate it to an appendix if it, like you said, a part of it's just format. But if it's a number's part of 53, probably better. But capturing at least at a high level those principles, categories and principles in the actual regulation I think is important.

One of the things that the GDCs do is that they -- this is going to sound a little strange, but it makes the regulatory process much more predictable.

By which I mean the staff uses the GDCs for their determination of the performance of a system, the performance of the reactor as a whole. And this provides predictability in the regulatory review process.

The expectations are clear up front and the framework of the GDCs provides a structure for the staff to conduct its reviews as reflected in 0800, the Standard Review Plan, in great, great detail. I'm not proposing 0800, but it allows them to -- you want to be technology-inclusive and at the same time flexible because there are such differences in the designs that we expect that you will be reviewing in terms of technology choices and specific issues with each of those technologies. But it avoids what I'll call the arbitrary and capriciousness of other reviews, like in the DOE world.

And I won't go any further with that comment on the public record than --

MR. RECKLEY: Okay.

MEMBER KIRCHNER: -- to say it provides structure and expectation. So I think it's very important to capture that GDC framework in the actual regulation not relegated to a reg guide, although the reg guide that's been developed is very nice about

adapting for specific reactor technologies. But I do believe you do need something like the GDCs as a part of the framework.

MR. RECKLEY: Okay.

CHAIR BLEY: Some words from the joint committee and the AEC back in about 1960 --

MR. RECKLEY: Did Dennis drop off?

CHAIR BLEY: No. Did you hear me? I just made a comment.

MR. RECKLEY: Oh, okay. As we go through the interactions with you guys and stakeholders in general, trying to strike that balance between predictability and clarity that you get through something like the GDC versus the flexibility that you get through performance based approaches more like that presented in NEI 18-04, trying to get the best of both worlds and where that balance is, that'll be part of what we're trying to do in this rule. And it goes back.

I guess Dennis is -- well a number of members might remember. But this is in some part kind of related to the structuralist rationalist approach that was the number of a whole bunch of ACRS meetings and interactions and papers back during the development of, I guess is that reg guide 1.174. Back

in that timeframe. So many of those questions remain what's the right balance. You have to do both, I think. You can't have it all one way or the other. But trying to strike the balance is what we'll be trying to do. So --

MEMBER BROWN: Bill? I just had -- I'm a little bit parochial, I mean a little bit with this particular comment. Since I do I&C stuff, protection reactivity control systems, when I go back and look at what it's like, GDC 20 through -- I don't know, 29 or 30 or something like that. Those are basically performance based. I mean is the idea that I don't need independence if something's performance based? Or that I don't need reliability and testability?

MR. RECKLEY: No, no, no. Again, I --

MEMBER BROWN: Bill, I'm losing the bubble a little. I keep hearing this performance based stuff. In my mind, I know what performance based means. I'm not so sure it's well defined even in the way I think about it. Like protection system functions to shut down the reactor. What it needs to be is that's a performance based function. Like Walt says, throwing the baby out with the bathwater gets a little bit difficult for me --

MR. RECKLEY: No, no. Yeah, not --

MEMBER BROWN: -- in a longer term view.

MR. RECKLEY: Yeah, okay. And I didn't mean to imply that many of the GDC are relatively flexible and performance based in terms of giving you options as to how you might incorporate those things into the design. So no, I didn't mean to make that implication.

MEMBER BROWN: No, I'm not accusing you of anything. That was not my intent, I'm sorry. That was not my intent. It's just I get a little bit concerned when people lose sight and they start thinking everything in these GDCs is prescriptive, but it's not. Even the coolability issues. Forget the instrumentation type stuff, you go back to reactor cooling. All reactors has to be cooled in some way. And that particular GDC just fundamentally said you got to be able to cool them under various conductions.

MR. RECKLEY: Right.

MEMBER BROWN: So I think we just have to be very, very careful about thinking about doing everything brand brand new, and then we lose what's been learned. Like Dennis says, many of these things evolved after -- the first plant shipping port didn't have any of these.

I mean they were kind of modeled after the

way we did the Navy plants in terms of principles. So I mean I just get concerned that we lose what we've learned over 60 years, which has been very valuable, in the process of trying to get something that's more reasonably approached from a licensing and a review basis.

MR. RECKLEY: All right.

MEMBER BROWN: I'll quit right there.

MR. RECKLEY: Okay. And again, we'll test all of this out as we go forward. The only thing I'll mention, as we go forward and look and different technologies, the role and the importance and the timing of some of these changes, and the general design criteria for light water reactors were developed.

And I agree with you, they are performance-based and they generally at the high level. But they were developed with the notion in mind that reactivity was something you had to address very quickly because a mismatch between power and heat removal and a light water reactor is something that is a fast-acting transient.

When you get over into some of the other non light water reactors that might have more thermal margins or thermal capacities, some of the specifics

may change. And we just need to be able to look at that and see where -- what would be the most appropriate criterion. I mean this is getting down into the details, and we're still working on the framework. So going over just converting that figure into what Part 53 might look like, we would think it might look like this. You would have general provisions.

All the regulations have to start off with a certain amount of those provisions that tell applicants and licensees and the NRC staff how the process works. But then going back to the figure that you would have -- for example, I'll describe these in terms of subparts, just like Part 52 is divided into subparts. But maybe you have subpart B, and it would talk about those safety objectives.

What are the regulatory limits? How do the safety goals figure in? And that sets out how safety the facility has to be. And then you would go into, again as I mentioned, what's the role of the design requirements, what's the role of siting, what's the role of construction and manufacturing in meeting those safety goals.

The requirements for operation in terms of programmatic controls that we talked about.

Configuration control, maintenance and surveillance. And then what would be the role during decommissioning or retirement? And then you would have those parts of Part 53, or those subparts related to licensing and maintaining the licensing basis information. So this is all of the -- this is basically -- Part 52 is largely oriented towards the applications. Then the things like 50.59 for controlling your licensing basis information, 50.74 on providing updates to the FSAR and then administrative requirements.

So this is just a general possible layout. And then getting to Dennis's question on how we might interact, if we were to develop a framework like is on Slide 5. If we have some early discussions and thinking that something like this would be the way to go, then the most important thing, because everything is built off of it, would be the purple box.

And we would want to start having discussions on that, you know, as early as later this year or very early next year because whatever schedule gets defined for us by the Commission when we get our instructions, if we keep this framework, it all builds off of how do we define the purple box on Slide 5.

Again, in terms of timeframe, I could see those interactions and discussions going or starting

as early as later this year or very early in 2021. The ultimate schedule of when we would have to finish those discussions, the Commission will tell us.

So within the whitepaper, and I heard it mentioned earlier, the whitepaper by and large -- we started writing an Advanced Notice of Proposed Rulemaking because that's what we proposed to do in the rulemaking plan. It was just a vehicle to start us to engage stakeholders. What you're seeing in this whitepaper is what we started as the ANPR, whether we end up doing that or not.

The most important thing is that we start to engage stakeholders, whatever vehicle that might be. So one of the things that we would be looking for both from the ACRS, since that's today's discussion. And then we'll be having this same discussion with public stakeholders. What is the interest, what do we see as the major issues and challenges so we can set out a schedule and a kind of a plan as to how we're going to talk about the various issues.

MEMBER BROWN: Bill?

MR. RECKLEY: Yes?

MEMBER BROWN: When you talk about stakeholder interest, didn't the -- what is it, the NEI whatever it is, didn't that say do it as opposed

to asking people if they have interest in that rulemaking? Don't you have to do the rule now based on the rule?

MR. RECKLEY: Yeah, yeah. I'm sorry. We have to do the rule. The question would be what are the stakeholder's interests in working with us to do the rule, not whether we do the rule. Do they want to play, or do they just want to tell us go do it and we'll see what you propose at the proposed rulemaking stage, and then we'll comment.

We hope that's not the point. I mean the outcome. We hope stakeholders agree to work with us all throughout the development of the proposed rule so that we don't spend however much time coming up with a finished product, and then people telling us they don't like it. So that's what I mean by stakeholder interest.

MEMBER BROWN: It sounds like you would be then in the mode of offering them at each stage, which you have something to propose, you reach out to them.

MR. RECKLEY: Right. Right.

MEMBER BROWN: Is that what you're talking about?

MR. RECKLEY: Yes.

MEMBER BROWN: Okay. All right.

MR. RECKLEY: I think that's how it will work by the time we're instructed. And then the other part is the last bullet, preparing both the proposed rule and seeing what related guidance might be appropriate, and we're receptive to any aspect. The next few slides we're going to start going through some of the questions.

MEMBER BROWN: Can I interrupt you one more while you're on Slide 7? When you go out for comments or stakeholder interest, I went back and pulled up the 2006 ANPR, whatever it is, which was multiple pages and was so broad, I mean it sounded like you had so much stuff, nobody would ever get anything defined. Are you going to try to narrow it somewhat more?

MR. RECKLEY: Well yes, and as an example --

MEMBER BROWN: That was a disaster in my own mind.

MR. RECKLEY: Just as one example, that particular ANPR had I think 60 questions. We did look through it and we tried to narrow it down to start the interactions I think. I mean they did have a companion document in 2006 that kind of went over the framework.

I think because we've been directed to do a rule, we have somewhat of an advantage in -- well in that we will be past the question of whether to do it, and people should be providing feedback on more specific things about what should be in it and how it should look. But yes, we are going to try to narrow it down. And it's a good teeing up, I guess, to go in the next couple slides. One of the, on Slide 8 is just the rulemaking objectives. I don't think this'll be surprising, number one.

And two, it's basically to maintain the same level of protections as exists for the operating fleet. And then the third one is going to, again what the Commission told us most recently in the Staff Requirements Memorandum for SECY-19-0117. And then in more description in an older SECY that goes back to SECY paper 10-0121.

And this is where the third objective of the rulemaking comes from, which is to ensure that to the degree advanced reactor designers are able to provide attributes that are talked about in the Advanced Reactor Policy Statement, that the expectations in that Advanced Reactor Policy Statement is that those attributes, things like less vulnerabilities to accidents, increased thermal

margins, slower responses leading to releases, those kind of attributes in the Advanced Reactor Policy Statement gets translated into operational flexibilities.

And one example we've used in the past is the tradeoff between those attributes and reduced consequences that then enable you to do things like reduce emergency planning zones, or come up with different criteria for population related siting considerations. And then number four and five are just trying to make sure the proposed rule is developed such that it's clear.

And this would also be an opportunity during which we might have to identify and resolve areas like staffing. And the time period that we have to resolve issues like that might get determined by the rulemaking schedule if it's not needed to be resolved for some other reason, like an actual application.

CHAIR BLEY: Bill? Two things, this is Dennis. This number five is a little rule-y, I think. One problem I envision is that some of these issues won't be clear. Turn it around. When you see some new unique facility design that mixes chemical hazards and nuclear hazards in odd ways, new problems will be

identified.

I think somehow we need to leave a -- by the time we're done, we need to leave something like your number five that has to be resolved on each new unique design. I don't think you can resolve all, you know, identify these up at the level you'd be working at for a technology-inclusive rule.

And the other thing is we've got an hour left, so as you can comb through the questions, we can go through those in about 45 minutes. That'll leave us a little time at the end to get comments from the public and from the members of the subcommittee.

MR. RECKLEY: Okay. Again, I was just planning to step through the questions at the highest level. Most of them, or many of them, we've talked about before. This first one just have we defined the right objectives. Second one, we are taking the definition out of NEIMA in terms of what reactors were under construction, given AP-1000 was under construction at the time. Our general thought is that that captures generation three and three-plus type reactors as not needing to be.

It's not excluded, but they don't need to be in the scope. And so just a general question about what should be within the scope. You can tell we've

given some thought, I think, to where we envision this going. But one of the simplest questions remains for Part 53, do we incorporate in, as Dennis I think you mentioned earlier, do you try to incorporate within it the licensing processes, so they'll be sections on licensing, or do you just try to define technical requirements and then refer back to Parts 50 and 52 for the licensing part?

Again, there's no right or wrong to any of these things. Some of it is just ease and understanding and clarity as to where the rules are. But a question that we have is what do stakeholders think about what Part 53 should look like, whether it's like we describe it or whether it's more narrow to be just technical requirements.

A big one, again, this is within the previous figure. The way we're currently thinking the rule might look, this becomes kind of like the foundation or the cornerstones on how the whole part would work is how do you define the performance criteria. And is it possible to define a single set that's possible for all technologies?

That would look, again, at the NRC safety goals at the highest level, not necessarily the surrogates that were developed later for light water

reactors in specific, but going up to the higher level safety goals looking at consequences in terms of off-site doses.

MEMBER KIRCHNER: Bill, this is Walt Kirchner. I'm assuming, since you -- based on what you just said and also the previous idea, I'm assuming that you would take the same approach as 50 and 52 with regard to dose limits, which gets into consequences of course. That you wouldn't try -- I mean 10 CFR 100 is 10 CFR 100.

You're not going to try and change the outside to 10 CFR 50, 52 part of 10 CFR. In other words, I'm not saying this very well, you would take things like -- and forgive me if I don't remember the exact number. It's 10 CFR 52.34 which talks about contents of applications and demonstrating that the dose at the exclusionary or boundary is less than what, 25 rem per two hours. And at the LPZ, 25 rem for the entire course of the event, et cetera.

MR. RECKLEY: Right.

MEMBER KIRCHNER: I'm assuming we would still use those and put them in 53.

MR. RECKLEY: Yeah. Our interpretation of past commission decisions, including the ones I mentioned, SECY-10-0121, and then even more recently

SECY-19-0117, is the Commission is telling us those metrics are good enough and are to be used.

MEMBER KIRCHNER: Good, good. That makes your job a lot simpler actually if you --

MR. RECKLEY: Well it does. Yes.

MEMBER KIRCHNER: Yeah. And it provides some agreed upon basis to -- as measures for what's acceptable in terms of --

MR. RECKLEY: Right.

MEMBER KIRCHNER: -- consequence to the public. Okay.

MR. RECKLEY: And then just as we were having discussions early on, on reg guide 1.233, part of the what we'll need in my view to construct within Part 53 though is that advanced reactors have said that when they incorporate the attributes from the Advanced Reactor Policy Statement, that they are able to meet those criteria and then have margins that are greater than what we've seen historically.

And then they want to use those margins to do things like incorporate smaller emergency planning zones, reduce staffing, or other things. And so to me, the trick within Part 53 will be to have -- to use those potential advanced reactor attributes and build within the rule how it interplays with those other

areas to give them the operational flexibility. And that's one of the reasons we built it in as an objective so that we could get some comment and suggestions on that.

CHAIR BLEY: I'd remind the members that we wrote a letter not too long ago on the staff's implementation action plan on population-related siting considerations. And then in paper, the staff was not recommending any change in the current rule where Walt was, but it was recommending a change in the guidance for implementing that rule, especially the guidance dealing with population density requirements. And probably, you'll be using these implementation action plans as part of your thinking going forward. I assume that's why they're there.

MR. RECKLEY: That's right. And we're trying to tie these things together and make sure we get maximum use out of things like what we just talked about, the reviews that were done of NEI 18-04, and the ongoing reviews of things like TICAP. We want them, if at all possible, to be supportive of what we're doing under Part 53.

Risk metrics, more specifically I guess a question. It's related to the previous question on setting up the performance criteria. But to what

degree do we incorporate the safety goals into the regulations? That would be a change in how we've historically treated that particular policy statement, and the consideration of risk insights.

So we have a question in that regard: would people expect to see something like a frequency-consequence curve in Part 53, or would it be at a higher level and simply talk about managing the risks using appropriate consideration, some higher level language. And then things like frequency-consequence curves, or the target figure would be in guidances.

All of these things we'll kind of have to work out and decide as we prepare the rule. And then to the degree that we are already thinking that things will need to go in guidance, we'll have to consider whether the existing guidance is at the right level or whether we need additional guidance.

Again, we gave some thought in the rulemaking plan and we talked that we think it should be addressing the whole lifecycle of the facility, not just a licensing framework. But that's what our thinking is. We're looking for feedback.

Going to what Walt was mentioning earlier, there's a whole range of terminology. And we realized even in SECY-19-0117, we were using different

definitions than were in Part 50 and 52. So one question is just on definitions: is it okay for Part 53 to define a term different than it's defined in Part 50, or do we need to try to make sure we avoid that kind of confusion within the whole Title 10, if you will?

Just a general question on performance-based regulation. The Commission, since 1990s, has had a general policy of encouraging risk-informed and performance-based approaches. Just a general question on how we might incorporate performance-based concepts such as the guidance document that was produced back in that timeframe in the early 2000s, NUREG/BR-0303.

CHAIR BLEY: Hey, Bill? Can I back you up one? On the definitions, it's not something I usually get too concerned about. But I think it does create difficulties with changing definitions. And I know the staff has put together a glossary of definitions trying to avoid this problem.

And, boy, it seems like it would be worthwhile to try to clear that up. I know you got some difficulties now with the NEI document. But being consistent within the regulator offers some real help to people who are trying to use it, although that would require bringing other documents into agreement.

MR. RECKLEY: Yeah. I don't disagree, but it's a challenge. Only because --

CHAIR BLEY: I get it.

MR. RECKLEY: Yeah. Talked about this one. One of the questions that we're raising is that, this goes really back to the objectives, and we had two levels of safety defined under the objectives. One, the traditional reasonable assurance of adequate protection.

And then the second one was the provision that we typically use when we are looking at a substantial increase in the overall protection, and we consider costs. So in initial licensing, we don't provide as much clarity on distinguishing between those two criteria.

And so this question is just going to stakeholders and say, as we develop this new part, should we be looking at those two things and distinguishing between the two. And even at initial licensing, should we be looking at cost-effectiveness when we're making licensing decisions.

MEMBER KIRCHNER: Bill, pragmatically, since you brought that one up as a question -- this is Walt Kirchner. Boy, at the initial licensing when you have -- and I don't mean this in a pejorative sense

for some of these advanced reactors, a paper design.

You're really not going to have specs or good cost information until you go out in the next step and do the, you know, prepare procurement specs and so on. So it would just pragmatically I think be very difficult to -- it could be open-ended arguments about cost at that phase.

I mean, they would be heuristic or estimates maybe falling back on LWR experience and pricing of equipment and such. But I just think that would prove very difficult at the initial stage of a specific license review.

MR. RECKLEY: I agree. None of these are easy, and they come with challenges to implement. As you just mentioned, this one would be somewhat hard to say at an early stage we're already deciding there's not a cost-effective -- that there is or isn't a cost-effective way if you try to make that decision too early on.

The other observation though is that, as we've looked at how we've done backfits on operating plants and even considered putting in place requirements that somebody would need -- would pick up at a future time, a forward-fit requirement, that

initial licensing wasn't talked about in those guidance documents, in the Management Directive 8.4, that provided additional clarity on how we use those provisions for initial license. So the question is should we. You're exactly right, there'll be challenges in trying to do it.

MEMBER KIRCHNER: If I'm the designer and I'm submitting my advanced reactor design, you basically if you think about you've got -- you're looking as a designer for a sweet spot. You're balancing cost, reliability, and safety. And they're all interrelated.

I would presume that your applicants will come in with their most cost-effective proposal, in their estimation, as their opening gambit. So I just would be concerned that it would be very difficult to get into -- you mentioned backfitting where you have actually a much better basis for making an estimate of the actual cost of the backfit versus the increased -- the gain in terms of whatever the metric is, rem avoided or whatever.

So my sense is that they will come in to you with their best most cost-effective proposal, and it probably will go in the other direction. I mean, the arguments that will ensue I predict will be, is

this system safety-related or is it not?

And if it wasn't safety-related and you insist and they have to change it to be safety-related, then it likely would cost more to first order. But, you know, but I think it would be very difficult to make that in the cost an initial factor in your review.

MR. RECKLEY: Again, I agree with you to it would be a challenge. You or someone else was asking earlier, how do you make decisions on defense in depth, and when is enough enough?

This question is somewhat related to that which is at what point when you're deciding how much additional margin to add, not only do you change the classification of a system maybe from non-safety with special treatment up to safety-related, but when do you even need to have a backup that would even be non-safety-related special treatment?

Again, I don't have answers. One of the questions is to what degree do we bring in this same logic that we use in the operating fleet to try to make decisions on when is enough enough?

This is question 10 on slide 16. Just again, a more general question of how do you take an integrated look and ensure that what you're doing in

terms of safety, security, how emergency preparedness fits in, how do you take this integrated look and make sure that Part 53 has enough? But it also provides the potential for flexibility where the safety features of the reactor might warrant it.

This is just a similar question to what we talked about before. We are using, or we could use within the rulemaking, things like NRC Safety Goal Police Statement from 1986. We think the Commission has told us to use that. But as a question to stakeholders, is this an opportunity for us to revisit?

One of the questions we put to stakeholders in a public meeting is to what degree is this an opportunity to align ourselves with other international standards? And should the rulemaking try to do that, or just recognize that as you go from country to country, the methodology is generally the same, but recognize that any particular point on a frequency-consequence target figure or any particular offsite dose criteria might change from country to country.

Again, the methodology will generally fit, but as you do your assessment, you still might need to make either different arguments or even potentially

make modifications to address the differences between standards. Again, it's a generally broad question of whether we should maintain what we have, or use this as an opportunity to look elsewhere, or look for tweaking the guidance, or tweaking the requirements in this case by changing what will go into Part 53.

Quality assurance, this was an issue people mentioned back in 2006, is some of these questions are basically the same questioned we asked back in 2006 in that ANPR. And whether there's an alternative to how we're currently doing quality assurance. Not that quality assurance doesn't remain fundamentally important, but is there time now that we might look for different ways to do it?

And now that you have QA organizations surrounding NQA-1. You have additional standards on the international arena. You have a whole set of ISO standards. So just a general question of whether we could revisit how that's done. This one goes to the guidance and standards area. If we're going to develop a Part 53, it'll have a large -- it could potentially have the need for a large number of standards and guidance documents.

So this question is to stakeholders, are we going to have either standard-development

organizations or NEI or Nuclear Industry Council or some other group identify potential guidance documents that we could endorse. Or to the degree there are needed guidance documents will it fall on the staff to try to develop those as we're doing the proposed rule?

And then the catch-all question 14 which is just, you know, these were just some initial questions. We boil down the strong events and then we boil down the 60 or so that was offered in 2006 to 14 questions. But are there other matters that we didn't identify that people want to bring up?

So with that, Dennis, we're open to the broader discussion and then also maybe the path forward in terms of starting to talk about when we might come back.

CHAIR BLEY: Yeah. I think that's good. But first, let's go to the members and see if any have more questions or want to say anything about the questions you folks have posed.

MEMBER PETTI: So, Bill, this is Dave Petti. I didn't hear a lot about certification about the overall approach, which is something I hear in the advanced reactor community a lot. In terms of how you weigh all these questions, it just seems to me that simplification and the schedule is being imposed from

the outside, they answer your questions for you instead of, say, the more thoughtful approach.

MEMBER BROWN: Dennis, I can't really hear you.

CHAIR BLEY: That was Dave Petti.

MEMBER BROWN: Oh, Dave? He's speaking very softly. I couldn't hear him. I didn't know if it was your connection or what but I just --

MR. CORRADINI: I think, Charlie -- this is same as Corradini. I barely hear you, Dave. You're very muffled.

CHAIR BLEY: Well, he asked some questions. If Bill heard him, maybe he can respond. If not, maybe Dave can say them again.

MR. RECKLEY: Well, I'll summarize, Dave, and push back if I mischaracterize it. But Dave's primary point was simplification in both design and I think expectations for what would be in Part 53. And we hear those. The other thing I would point to in Part 53 in addition to trying to make sure we're able to address simpler designs, ones that are using more inherent and passive features, is when you try to make this rulemaking technology-inclusive, our preliminary thinking is that pushes you up higher to be more general, to be simpler in what the rule requires.

The counter to that, as some other people have raised, is you are now perhaps less clear because you're now saying you're up at a functional level in terms of what you're imposing in asking applicants and designers to provide. So that'll be I think one of the primary challenges, is to try to balance the -- what I'm looking at now, the Part 53 rulemaking, the simplicity that we want to maintain and keeping it up at a high level, and then the tradeoff with clarity because the higher you get, most likely, the less clear you are.

MEMBER KIRCHNER: Bill, this is Walt Kirchner. If I might make a specific observation, and also given the schedule that you're likely going to have to work against, it seems to me that one would -- borrow is not the right word, but use what are accepted metrics that are well-defined or actually, how should I say it, that can be calculated by the applicants.

And I'm referring again specifically to the dose at the exclusionary boundary and the LPZ, and rather than the safety goals themselves. I have the safety goals right in front of me, as you were speaking, and I just quickly looked at them again. And I think that if you were -- just what you were

saying, if you go that high a level, you open the door for endless arguments.

And even the safety goal statement, which I have in front of me, points out that there are sizeable uncertainties still present. Now this was written -- and I'm talking about the quantitative parts of the safety goals. When was this written? In '86. I would submit there's still large uncertainties in terms of the relative measures versus, you know, the more qualitative goals.

So if you use that, I just don't see how you get to closure. It seems to be a much better path as to use what is accepted as a surrogate for the safety goals in the case of dose there at the EAB and the LPZ, and then do things like the paper Dennis reminded us of your proposal on how to then take the existing regulations and provide guidance in terms of determining, like, LPZ.

And that to me would pragmatically let you get to closure in a reasonable timeframe. If it gets too high-level, I just don't know that you can get to closure. Or you don't get to closure with the applicants because of the large uncertainties in the actual licensing process, if indeed they're going to compare against the safety goals. You see what I'm

saying?

MR. RECKLEY: Yes, I do. Again, and that'll be the challenge. I think our initial thinking is that we would probably end up using both. But both the traditional 25 rem at the low population zone, or EAB. And in addition, somehow using the safety goals. But how we do that, that'll be part of the discussion as we try to set up what the performance requirements would be.

MEMBER BROWN: I would just echo Walt's thoughts a little bit because the lack of specificity or what people term as prescriptive requirements just increases uncertainty and an increase number of RAIs and back-and-forths on why you're doing it this way vice the other, and it becomes very difficult to close those out. That's a real worry to me as well. I'm not trying to argue one way or the other, I'm just saying that is a problem.

MR. RECKLEY: And we'll be looking for real smart people to help us with that, like you guys.

MEMBER BROWN: I'm not so sure anybody, or there's enough smart people in the world to do that. There's always a -- I mean, a typical example in my area is control of access that we keep fighting over on every design in terms of do you give people a door

that's software-controlled out to the outside world, that they can come in if they want to, or do you just close the door based on hardware? That's a specific thing.

That's just my own parochial area that I have to deal with. I just think you can fight about that forever and say, well, gee, I can do it whatever way I want. Well, no. We don't want the door open. somewhere, you're the regulator and you're responsible for safety. Your ultimate issue is safety. Sometime you have to say, no, do it this way. I can see that being we're falling away from that in some circumstances. That's always the other argument that seems to want to prevail. That's my thought process relative to Walt's comment.

MR. CORRADINI: So, Bill? This is Corradini.

MR. RECKLEY: Yes, sir.

MR. CORRADINI: Can you hear me?

MR. RECKLEY: Yes, sir. I can.

MR. CORRADINI: Okay. So let me ask you a couple of pointed questions, and you tell me that that's to be determined. So I'm thinking about this relative to a research reactor as an alternative. In a research reactor, whether it be one megawatt, or a

few megawatts, or a sub-megawatt in size, I don't have to worry about external manmade hazards.

Is there a power size here that's going to say that if I'm below a certain power size, I don't have to worry about external manmade hazards, or must I consider it regardless? And then I add to that concern about multiple modules.

If I decide that I have a small machine and meets all the new criteria of the new 10 CFR 53, does that mean it's on a per-module basis, or is it a population of modules on a site? Are those things going to be identified in 53, or did I miss a question in that area?

MR. RECKLEY: Well, they'll need to be addressed in Part 53 in terms of the natural -- I mean, manmade hazards, and to some degree even natural hazards. It, on approach can be as you identify those top-level criteria that I mention back in the figure, the purple box, what are the dose criteria, what are the risk metrics.

Then you can look and see in terms of hazards, manmade or natural, is there a way -- I guess my response would be you have to address it. But one way to address it might be there's no way for a manmade hazard or some other hazard to challenge those

performance metrics. And so if I look at a manmade hazard related to, let's say, toxic gases, if I have a plant that doesn't require people -- so I'm building a house of cards here, but if I have a plant that doesn't require people, then maybe my concern about toxic gases is less.

A design feature, like putting a plant underground, might be able to address something like explosions from a nearby railroad line, or an aircraft crash. So they will need to address all of those things, but they might be able to address them by having design features that show that those hazards can't challenge the safety metrics that are established within the part. In terms of multiplant versus -- or multiunit, you know, NEI --

MR. CORRADINI: Bill, whatever you want to call it.

MR. RECKLEY: Right. NEI 18-04 was set up on per plant basis, which is different than Part 50. One of the questions, maybe we should have added it, is a question would be, should Part 53 be set up that way. When we said throughout the development of the Part 53 that we would build off of things like Reg Guide 1.233, it does provide us a vehicle to go to multimodule, and address it perhaps more clearly than

Part 50 has.

CHAIR BLEY: Okay. Thanks, Bill. We're nearing the end, but I'm going to -- I'm sorry, we'll get a chance to go around and have members make comments. While Bill's still up, let's only address questions to him and save comments for a couple of minutes from now. Go ahead, Vesna. You had something?

MEMBER DIMITRIJEVIC: Well, I'm going to save comments when we go around.

CHAIR BLEY: Perfect.

MEMBER DIMITRIJEVIC: I don't have any question, I just have a comment.

CHAIR BLEY: Perfect. Anybody else have a question? Then at this point, I'm going to thank Bill very much, and all of his staff who helped out on this for giving us the status of where they are. When we go around to members, I'm also going to ask you about October. If we would have an October meeting, I would ask the staff to have a very short presentation just on Part 53.

And the reason we'd do that is if we want to write a letter. I'm inclined that it'd be a good time to send a letter to the Commission, just a short one, saying we're on board, we're following this. And

we have a couple of issues, if we do, that we want to make sure the staff pursues. But we'll get to that in the minute.

Are there any members of the public either on the web broadcast or on the outside line who would like to make a comment? Please make sure the outside line is open for us, our staff.

OPERATOR: The line is open for comments.

CHAIR BLEY: Okay. Is there anyone from the public who would like to make a comment? If so, give us your name and your comment.

MR. LYMAN: Hello. This is Ed Lyman from the Union of Concerned Scientists. Can you hear me?

CHAIR BLEY: Yes, Ed. We can. Please go ahead.

MR. LYMAN: Yeah, hi. Yeah, so I appreciate this meeting. I'd just like to say that UCS did not oppose the passage of NEIMA, and we testified twice that we have a neutral position. The reason why we didn't oppose it is because we believe that it gave the Commission enough discretion and did not micro-manage what to do vis-a-vis licensing advanced reactors.

And so we didn't oppose it because we thought the Commission, you know, with that discretion

and with the competence of the technical staff that it would do the right thing. But I'm starting to regret that decision. And that is because I don't believe this is going in the right direction. And I do appreciate some of the concerns I heard raised by members about the ambiguous and the amorphous nature of what's taking place here.

The potential for not only having discretion on how standards are met, but also what the standards actually are. And that seems like an invitation to chaos. And I don't think the vendors, if that's what they thing is going to help make their lives easier in trying to license these reactors, I think they have surprises ahead because I don't see how this -- how weakening or making standards more ambiguous is going to actually help in resolving these issues, many of the difficult issues that we heard with how do you license paper designs with very limited operating experience, or no operating experience with a very weak or sparse experimental database with regard to only important factors that would need to go into these determinations such as mechanistic source term.

So I'm very concerned about this, and I do hope that the committee will express it's concerns,

and hold the feet to the fire because I don't think that the Commission's political leadership is actually safeguarding public health and safety in this respect. On that note, I can't think of any other regulator that is so content with not imposing stricter safety standards on future facilities.

So we have this whole enterprise is based on this artifice that the Commission expects advanced reactors to be safer, and it's building a regulatory infrastructure based on that expectation. But as we heard Bill Reckley say multiple times, even for designs that have some inherent safety features, that the vendors are going to look for ways to use that margin in other ways.

And so without a strict or a compelling mandate from the Commission that you have at the end is going to be in return fleet, you're going to end up with reactors, you know, possibly locking for decades to come with using the additional margin up in getting relief for things like EPZ security and safety already in the system. So that just doesn't make sense to me for a forward-thinking agency.

And so I would encourage everyone to think about how to make plants safer in the future rather than just embrace the status quo. For instance, rely

on the safety goals, which were developed decades ago specifically so the parent fleet would meet them is not an appropriate parameter to use if you're going to use a new criteria. So that's my comment, and I appreciate your time. Thank you.

CHAIR BLEY: Thanks very much, Ed. And we have your comments on the transcript. We appreciate them. Anyone --

MEMBER BROWN: Someone was just speaking. Dennis, who was just speaking? It got garbled on my end.

CHAIR BLEY: That was Ed Lyman from the Union of Concerned Scientists.

MEMBER BROWN: Oh, okay. I just wanted to comment I actually agree with him, a good bit of what he said. So thank you, Ed.

CHAIR BLEY: Anyone else have a comment from the public line? Okay, we're going to close the public line and come back to --

OPERATOR: Public line is closed.

CHAIR BLEY: I'm sorry, who?

OPERATOR: Public line is now closed.

CHAIR BLEY: Thanks, I'm sorry. Hear while I was talking. I'm now going to go around to the committee members. And I think this time, I'm

going to call people by name, because I'm looking for general comments and also specific thoughts if we should write a letter in October to at least lay out a few things that we want to bring to the staff's attention, and to let the Commission know that we're tracking this at this point in time. So let's go to Ron Ballinger.

MEMBER BALLINGER: Yeah. I agree with your comment related to we should meet and have a letter. I'm talking as a metallurgist now. Historically, we have had painful experience with respect to things that pop up in a design as we build it and over history. And they're largely related to, at least on the materials side, degradation that occurs that we didn't anticipate.

So I'm curious as to whether or not consideration, since Bill says we have an option, we actually have a clean sheet of paper, whether something could be incorporated in the requirements to take a look at what some famous government official has termed unknown unknowns. And I don't know how you do that, but it seems to me that there's an opportunity here.

We have an example of an unknown unknown that we're dealing with, with another plant design

right now. And so I'm just curious as to whether that some consideration should be given to that. Thank you.

CHAIR BLEY: Thanks, Ron. And maybe make some notes on that to have around come October. That'd be useful. Charlie?

MEMBER BROWN: Well, I've made most of my comments.

CHAIR BLEY: Back to your earlier comment.

MEMBER BROWN: I've made most of my comments earlier. But one of my general concerns I would echo Lyman's comment relative to everybody's assuming these advanced reactors are going to be safer and have more margin, but margin tends to get used to generate more power.

And based on the few designs, very few, there's a lot of other aspects to some of these designs that add other non-safe factors to how they operate and their waste products. So I'm not quite as confident that these new advanced reactors are all safer than the pressurized waters, which had a very definitive nature of unsafeness that we have to deal with, and we know what it is.

I'm worried about so much generality in the high level we'll be fighting about it, and we'll

end up not being able to get a plant defined very well. And so that's my general concern, is an overarching concern. So I'll be quiet now and let somebody else go on.

CHAIR BLEY: Thank you, Charlie. Now Vesna?

MEMBER DIMITRIJEVIC: Okay. I found the button to activate my microphone. Okay. I can actually -- I mean, I have too many notes actually to talk about that, so I will just keep this on high level. I think we definitely should write the letter about that. One is to address the questions.

I mean, which we couldn't do in all of those, my notes, if I, you know, go through them now where I can talk for half-hour. So I think that writing letter to address some of the questions from this presentation, and maybe to talk about licenses through our review of the advanced plants and some things like that, how would that help in the new regulation.

I mean, what issues did we notice that the regulation has an issue with it needs some, you know, exemptions and things like this. I think that can be very helpful. On the high level, I just want to say the following, that's it's no -- I mean, I don't think

the human race will progress if we always try to address all the risk associated with different things.

And obviously when we are meeting with some totally new designs, we will not be able to do that. So we can make an honest attempt to, you know, keep this as safe as our understanding in this moment, but we will have to learn, you know, with every new technology, new lessons.

So in my opinion, I think it's very good to keep this as simple as possible on this level. We were talking about cost-effective designs, but we also should talk about cost-effective regulation because we should really make this the practice going through approval not to be too complex, because the complexity doesn't really help in identifying important issues. It often, actually buries them.

So in order to keep this simple enough, I think it's also the selection of what is going to be criteria or risk matrix or criteria to -- what to base regulation on, that's very important to see how complex this regulation will become, you know. So for example, I'm not big fan as you know of the F-C curve. And because I think it's already complex and could lead to the many, you know, different combinations and different answers requires the source terms for so

many, you know, sequences, groups and things like that.

And that can be also as an option, but it should be open to other approaches to the measures of risk. And one other thing, which I always also think is extremely important, it will be very good to run some example how would that actually look in actual application.

And since we only have example of the existing plants or the advanced plants, which have the PRAs which are extremely complex, and example can be very complex. We can actually run it just on one attendant group. So simplify just to see example how would this all go through the process. That's it.

CHAIR BLEY: Thanks very much, Vesna. And for all members, if you get a chance to summarize your thoughts, then send them to me sometime over the next few months, that would be very helpful. I'll probably send out a reminder. Walt, let's go to you. We have your comment from a few minutes ago.

MEMBER KIRCHNER: Yes.

CHAIR BLEY: Any other comments?

MEMBER KIRCHNER: I've made a lot of comments already so I should be brief. Just yes to the letter. And what was not clear to me, it doesn't

have to be answered here, but whether 10 CFR 53 would be a one- or two-step process, or some hybrid. And address some of what I see problems in 10 CFR 52. And I'll just stop there.

CHAIR BLEY: Thank you. Yeah, I guess that comes under a kind of a lessons learned Vesna was talking about. After Walt, Jose.

MEMBER MARCH-LEUBA: Hello. Yeah, this is Jose. I'll also be short. I think we should have a letter, and I would like to schedule sometime to make like the advertisers do with focus groups. Just have a letter and go line-by-line changing the grammar, but try to reach a consensus of the group.

On the advice, I'm going with the following same advice that many of the members have already said, but attack it from a different point. My concern has always been, right, recently is the NUREG-0800, the Standard Review Plan, is an excellent document.

I mean, it's the best invention since sliced bread for locating reactors because it accepts all of the built-up experience, the crowd-sourcing of everything that can happen to one of these reactors. The tendency on new reactors is to start with that, and remove the items that don't apply, instead of

trying to seek outside the box and say what is my reactor applying -- that is not covered by the SRP. So when one identifies the DBEs, maybe I don't think it's a rule, but we need to make sure to say that the SRP is not the beginning -- it's not the endpoint, it's only the beginning. Look outside of it for your reactor particular things. Okay. And that's it.

CHAIR BLEY: Thank you very much, Jose. Dave Petti?

MEMBER PETTI: So my greatest concern is how complex this could potentially be for designs that will be much less mature than what historically has come to the Commission. And I'm just wondering if there's a way to have some pilot projects that could be done that even the ACRS could participate in to help us all just get a better understanding of what we think the issues are or could be to help, you know, get this over the finish line. That's it.

CHAIR BLEY: Thanks very much, Dave. Joy?

MEMBER REMPE: This time I'm slow on the button. Yeah, I would like to see us do a letter. I guess I have to quickly point out that when I became a parent, I realized that I had not thought of things that my kids could do to say, no, that's now what you should. A new rule was imposed.

And I'm looking at this figure on slide five thinking about the scope, as I've mentioned earlier. So I hope in our letter that we talk about the need to, as other members have said, to think outside the box because of new chemical issues and hazards, transportation hazards. And if we're going to do the whole lifecycle, we've never really thought a whole lot about the waste maybe, and the way we should, because we haven't as a country been able to address it.

And maybe we should think about that too in the lifecycle diagram. And so anyway, I would like to see us discuss that in our own letter. And I liked Jose's idea about having discussion times for the points, although I know you'll probably have a draft you circulate. But it might make it more effective on how we generate the letter. Thank you.

CHAIR BLEY: Thanks, Joy. Matt?

MEMBER SENSERI: Thank you, Dennis. The members have raised some very important points here in my judgment, and I don't have anything that I'll add on top of that. So I would think that the points are value-added, and that we should come together as a committee, get consensus, and provide our formal thoughts in the form of a letter, and that's all I

have. Thank you to the staff for the good presentations today.

CHAIR BLEY: Thank you, Matt. Now I think I'll turn to our consultant, Mike Corradini. Are you still there, Mike?

MR. CORRADINI: Yes, sir. I am. Can you hear me?

CHAIR BLEY: Clear as a bell.

MR. CORRADINI: Okay. So in going through all the members' comments, I think the one that I want to come back to, Vesna went through a series of what I'll call bullet points to kind of match exactly what concerns me.

And I think Dave said it best, which is we have to find at least a pathway through this because however much we say these are new advanced reactors, none of these things haven't been thought of in the 1950s. We might have new technologies that can be applied to them, whether it be to instrumentation or monitoring or materials, but these reactor concepts have been around.

So it's not that the concepts are new, it's a matter of how you essentially work with them relative to a licensing framework. And since staff wants to do a licensing framework that goes beyond

just licensing of a particular reactor type, I really do think we've got to keep it as simple as possible. Just because it's simple doesn't mean that the process is going to be non-conservative.

Just the opposite. You can think of it by keeping the same safety goals, whether it be the qualitative safety goals or the quantitative safety goals of CDF and large release frequency, or large release, radioactivity release. And still be more conservative in terms of how you estimate these advanced designs and how they perform, and still do a good job of it.

So my thought is to keep it as simple as possible. And I would just simply go back to what Vesna said, is she had three or four points relative to that, and try to at least do this. Now my recommendation would be that the ACRS get involved in this early and often.

Without that, we're going to come back to this and eventually and have all the same questions. And I think this possibly may be the one good example that the Commission wants ACRS input from the beginning. And so to the extent that, Dennis, you feel comfortable with it, I think you want to do this as much as possible. That's it, thank you.

CHAIR BLEY: Thanks so much, Mike. Gee, I'm happily surprised by all the comments from the members. I had a whole list of things I wanted to talk about, and I don't think --

MEMBER BROWN: Dennis, Dennis?

CHAIR BLEY: Yeah, Charlie. Go ahead.

MEMBER BROWN: I forgot one point when I was making mine, and it goes along with Mike's comment about the -- I forgot how he phrased it, simplicity or not getting too complicated. Bill's comments on their slide three relative to separating the design operational programmatic from existing licensing processes relative to permits, Part 50 and 52.

And that was an interesting comment because if we're going down this path, it seems to me you could simply this process if you did separate them. In other words, use what's out there for what I call the hammer-and-tongs part of the business as opposed to the more advanced thinking and advanced reactor concept part, which is the first part in terms of the regulations and technical standards. I meant to say that in my ending comments, and I'm sorry for interrupting you, so.

CHAIR BLEY: Thank you, Charlie. I kind of got it, but we'll have it in the transcript. And

for everyone, if you made some notes and you would be happy to send them to me, and I would appreciate that. I do have a couple of quick things. I agree with almost everything all of my colleagues have said.

I would like to talk some time in the next couple weeks with Derek, and maybe you can set this up Derek, but also Larry and Scott, for how we can legitimately do something like the focus group that was suggested by Jose. We talked about doing something like this in the past, and we've never really implemented it.

But given this is going to take a few years, and it's of lasting importance, I think it would be good for us to really hash out among ourselves our thoughts before we engage further with everyone. Bill, you're probably surprised that we need a letter, but we leaned so far that way that I think we should count on having a meeting in October, and a letter.

And I will ask, and we'll work through Derek on this, but we just have a presentation on Part 53. Somebody turn off their microphone. On Part 53 and fairly short because all but one of us was here at this meeting. I got involved in something, it took me back through the history a lot in recent months. And

there's an interesting history on the tech specs and the design criteria and how they came about.

But also our committee was pretty much opposed to the design criteria as being nothing more than sort of mom and apple pie. But after several years, both the Commission and the vendors and the staff convinced the committee that the value of all these things were all clear to the folks at the time they needed to be considered.

The value was it made it clear to people submitting applications what they need to consider. And that issue of taking out some of the variability in the licensing process was a key part of that. At this point, we'll be going forward. I don't think we have any more time.

And I guess there's another meeting coming up in about an hour. Thanks to everyone to today and especially further discussions from the staff. And I thank our former member, Rich Denning, for coming in to explain his comments. At this point, the meeting is adjourned.

(Whereupon, the above-entitled matter went off the record at 1:02 p.m.)

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ACRS Future Plants Subcommittee

Regulatory Guide 1.233
Guidance for a Technology-Inclusive, Risk-Informed, and Performance-Based Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light Water Reactors

July 20, 2020

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ACRS Interactions

- NEI 18-04, “Risk-Informed Performance-Based Technology Inclusive Guidance for Non-Light Water Reactor Licensing Basis Development” (Draft Revision N, September 2018)
- Draft Regulatory Guide (DG) -1353 (September 2018)
- Draft SECY Paper (September 2018)
- ACRS Subcommittee and Full Committee (February 2019) Meetings
- ACRS Letter Dated March 19, 2019

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Post-ACRS Activities

- Issuance of DG-1353 for public comment (April 2019)
  - One public comment received (R. Denning & V. Mubayi)
- NEI 18-04, Revision 1 (August 2019)
  (no significant changes from Draft Revision N)
- Issuance of SECY-19-0117 (December 2019)
- Commission's Staff Requirements Memorandum (SRM) related to SECY-19-0117 (May 26, 2020)
- Issuance of RG-1.233 (June 2020)
  (minimal changes from DG-1353)

Public Comment

- The development and interpretation of the frequency-consequence curve proposed to be endorsed in DG-1353 does not have a strong technical basis. An underlying weakness of the proposed logic of assessing each candidate licensing basis event is that results could be influenced by the way an analyst chooses to define and group event scenarios. A better approach would be to consider a frequency-consequence curve as not only a tool for assessing individual licensing basis events but also as a bound on the complementary cumulative distribution function (CCDF) of accident sequences.

  (ADAMS Accession No. ML19158A457)

Disposition of Public Comment

(ADAMS Accession No. ML20091L696)

- The staff agrees that the approach described by the commenters may be a viable alternative to the methodology described in DG-1353 and NEI 18-04.
- Suggested approach (complementary cumulative distribution function) offers some advantages in terms of supporting the assessment of cumulative risk and the contributions from various licensing basis events.
- The methodology in DG-1353 and NEI 18-04 includes assessments of cumulative risks (e.g., a comparison to the NRC's safety goals)

Disposition of Public Comment

- NEI 18-04 methodology supports the established objectives
  - Identification and assessment of licensing basis events;
  - Establishing safety classifications and performance criteria for plant features; and
  - supporting evaluations of defense in depth

- Issues related to defining event sequences are expected to be addressed by the implementation of consensus standards, integrated decisionmaking processes, peer reviews of probabilistic risk assessments, and the reviews performed by the NRC staff.

- For these reasons, the staff has determined that the methodology described in DG-1353 remains one acceptable approach for informing the licensing basis for advanced reactors and decided not to alter the guidance documents as requested.

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SRM dated May 26, 2020

(ADAMS Accession No. ML20147A504)

The Commission has approved the use of the technology-inclusive, risk-informed, and performance-based methodology described in this paper as a reasonable approach for establishing key parts of the licensing basis and content of applications for licenses, certifications, and approvals for non-light-water reactors.

The staff should remain open to continuous, critical examination of its thinking regarding approaches and metrics for the licensing of this coming class of advanced reactors.

In its work on the regulatory framework for advanced reactors, the staff should continue to recognize that the Commission's established policy on the application of the safety goals and safety performance expectations provides an acceptable minimum safety standard for new reactors while taking into account the need to adapt the aspects of our current regulatory framework for reactors that provide operational flexibility based on risk assessment, such as the more than minimal increases in risk test in Section 50.59, the Maintenance Rule of Section 50.65, and the quality assurance criteria of Appendix B to reflect the significantly lower risks inherent in the design of advanced reactors.

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Possible Future Interactions

- Design-specific applications
- 10 CFR Part 53, “Licensing and Regulation of Advanced Nuclear Reactors”
- Mechanistic Source Term
  - INL/EXT-20-58717, Revision 0, “Technology-Inclusive Determination of Mechanistic Source Terms for Offsite Dose-Related Assessments for Advanced Nuclear Reactor Facilities,” June 2020
- Draft Regulatory Guide – Technology-Inclusive Content of Applications (TICAP)
- Regulatory Guidance – Advanced Reactor Content of Applications (ARCAP)
  - Content beyond TICAP/Licensing Modernization Project
  - Construction Permit Applications
- Microreactor issues (pending information SECY paper)
- SECY Paper – Staffing Issues (Licensed Operators, Autonomous Operations, Remote Operations)

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Questions/Discussion

Advanced Reactor Program

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Backup: Event Selection & Analysis

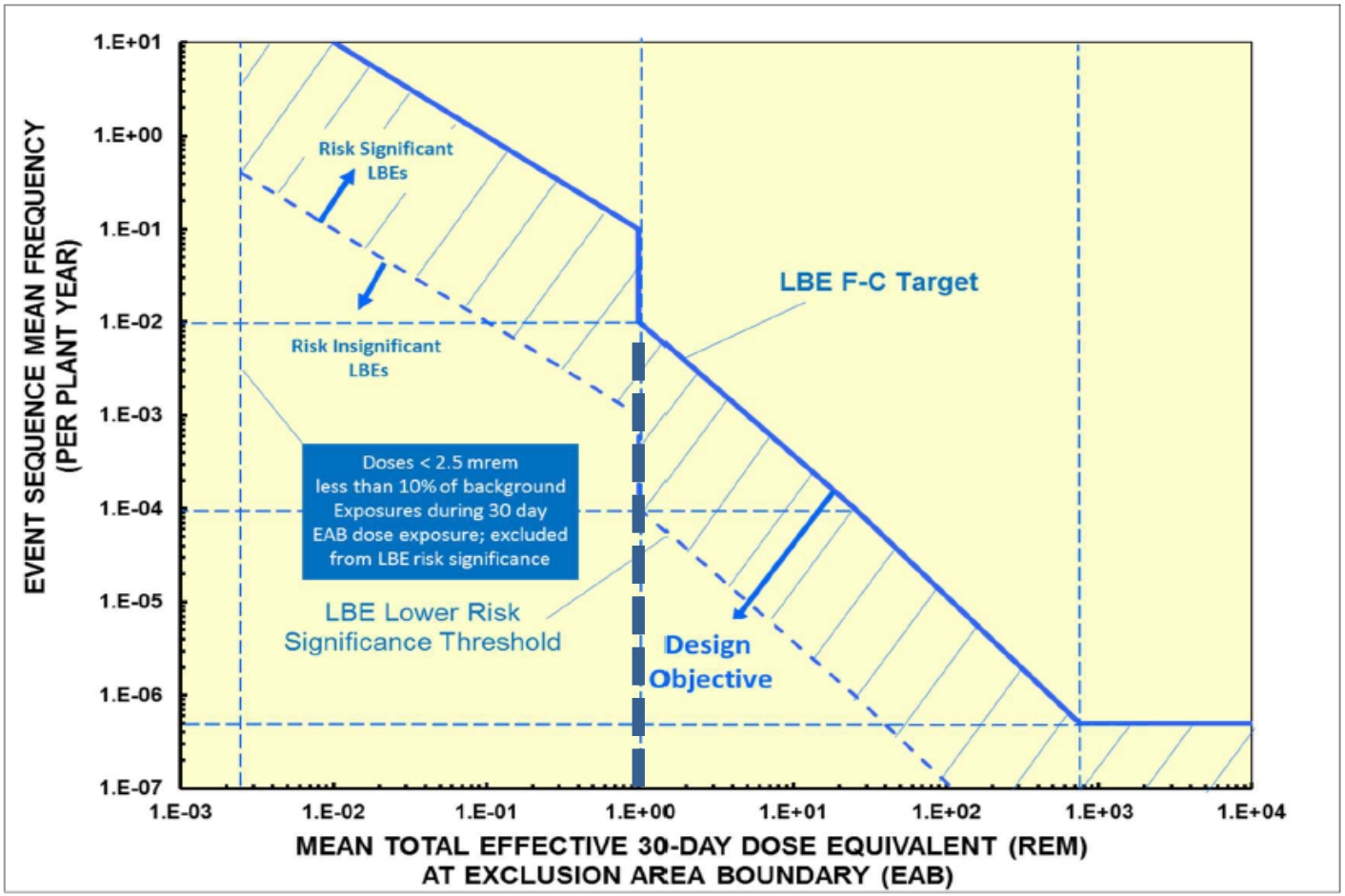
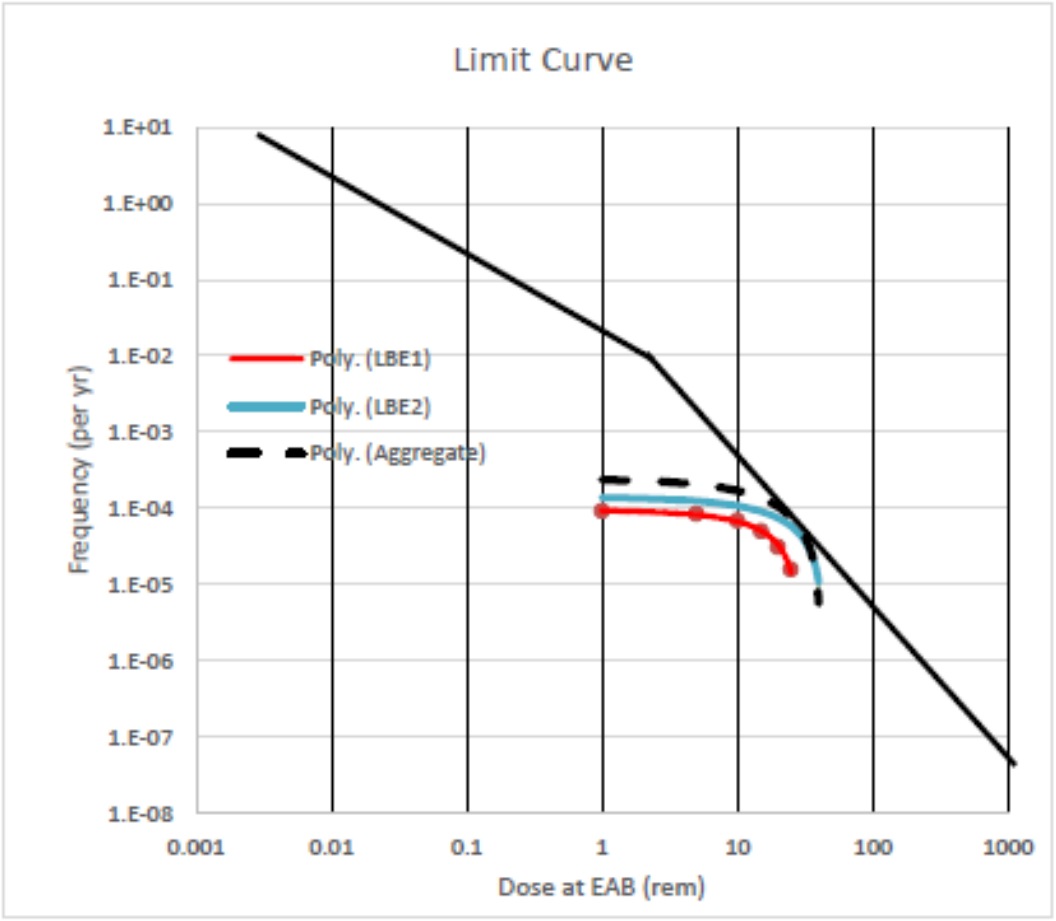


Figure 3-4. Use of the F-C Target to Define Risk-Significant LBEs

Backup: Public Comment

Example - complementary cumulative distribution function (CCDF)
See public comment, ADAMS Accession No. ML19158A457



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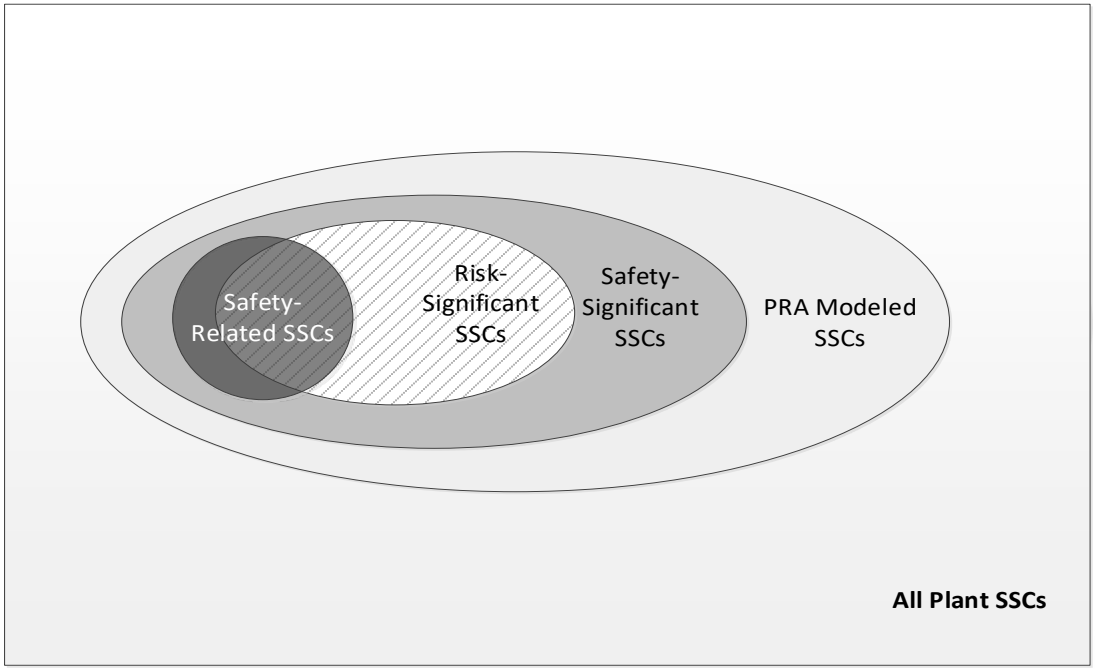
Backup: Risk-Significant SSCs

- A prevention or mitigation function of the SSC is necessary to meet the design objective of keeping all LBEs within the F-C target.
  - The LBE is considered within the F-C target when a point defined by the upper 95%-tile uncertainty of the LBE frequency and dose estimates are within the F-C target.
- The SSC makes a significant contribution to one of the cumulative risk metrics used for evaluating the risk significance of LBEs.
  - A significant contribution to each cumulative risk metric limit is satisfied when total frequency of all LBEs with failure of the SSC exceeds 1% of the cumulative risk metric limit. The cumulative risk metrics and limits include:
    - The total frequency of exceeding of a site boundary dose of 100 mrem <1/plant-year (10 CFR 20)
    - The average individual risk of early fatality within 1 mile of the Exclusion Area Boundary (EAB) < 5×10^{-7}/ plant-year (QHO)
    - The average individual risk of latent cancer fatalities within 10 miles of the EAB shall not exceed 2×10^{-6}/plant-year (QHO)

Backup: Safety-Significant SSCs

- An SSC that performs a function whose performance is necessary to achieve adequate defense-in-depth or is classified as Risk-Significant (see Risk-Significant SSC).

Summary



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ACRS Future Plants Subcommittee

10 CFR Part 53
"Licensing and Regulation of Advanced Nuclear Reactors"

July 20, 2020

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Background

- Advance Notice of Proposed Rulemaking, “Approaches to Risk-Informed and Performance-Based Requirements for Nuclear Power Reactors,” dated May 4, 2006 (71 FR 26267)

- NRC’s Vision and Strategy report (12/16) for non-light-water reactors and related implementation action plans identified a potential rulemaking to establish a regulatory framework

- Nuclear Energy Innovation and Modernization Act (NEIMA; Public Law 115-439) signed into law in January 2019 requires the NRC to complete a rulemaking to establish a technology-inclusive, regulatory framework for optional use for commercial advanced nuclear reactors no later than December 2027

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Background - NEIMA

(1) ADVANCED NUCLEAR REACTOR—The term "advanced nuclear reactor" means a nuclear fission or fusion reactor, including a prototype plant… with significant improvements compared to commercial nuclear reactors under construction as of the date of enactment of this Act, …

(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.

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SECY-20-0032, Rulemaking Plan

- SECY-20-0032, "Rulemaking Plan on "Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors," dated April 13, 2020
- Proposing a new 10 CFR part that could address performance requirements, design features, and programmatic controls for a wide variety of advanced nuclear reactors throughout the life of a facility.
- Focus the rulemaking on risk-informed functional requirements, building on existing NRC requirements, Commission policy statements, and recent activities (e.g., SECY-19-0117)
- Expect extensive interactions with external stakeholders and the Advisory Committee on Reactor Safeguards (ACRS) on the content of the rule.

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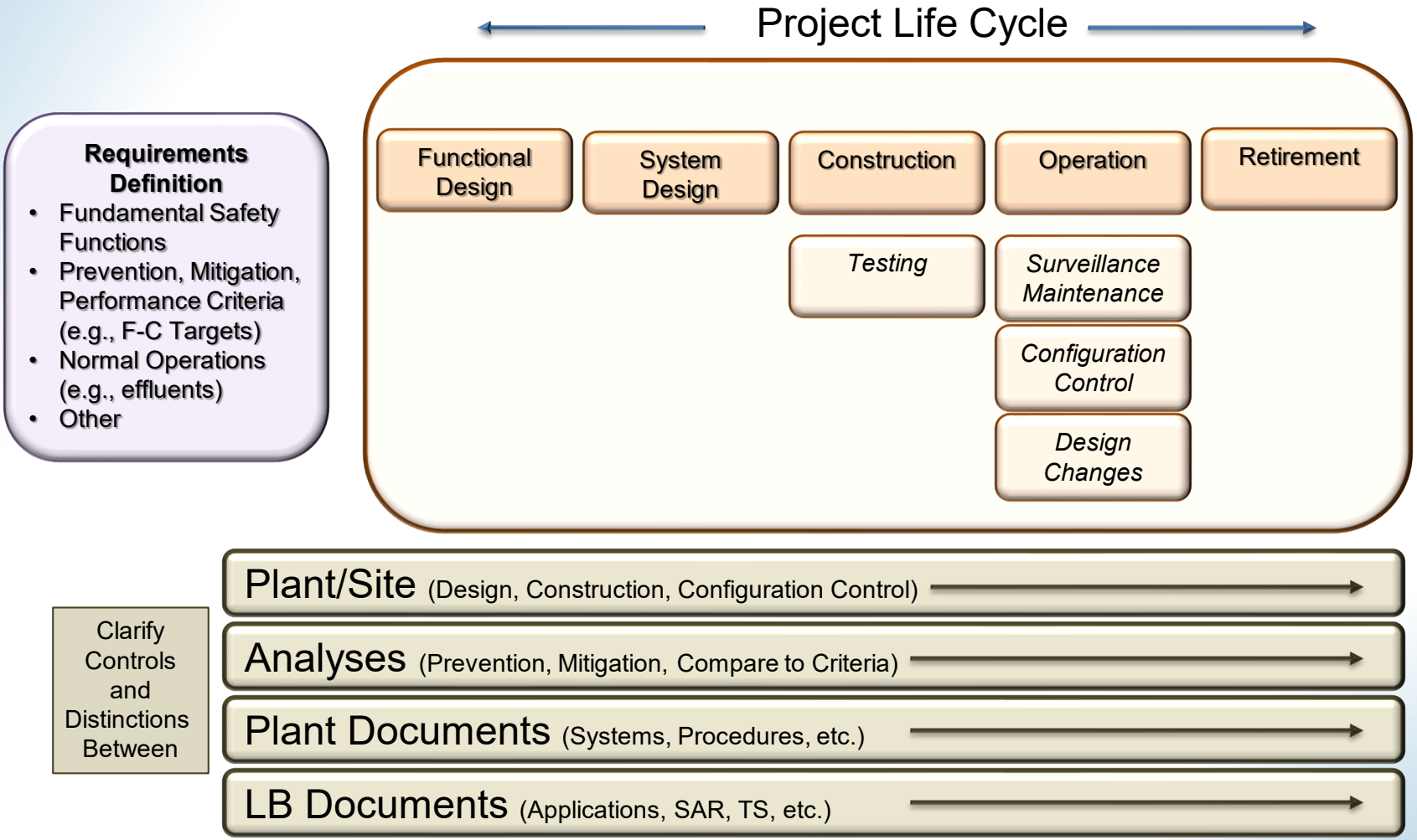
Technology Inclusive Regulatory Framework



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Example – Possible Layout

- General Provisions
- Technology-Inclusive Safety Objectives
  - Regulatory limits, safety goals
- Design Requirements
- Siting
- Construction and Manufacturing Requirements
- Requirements for Operation
- Decommissioning Requirements
- Applications for Licenses, Certifications and Approvals
- Maintaining and Revising Licensing Basis Information
- Reporting and Administrative Requirements

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NRC Staff White Paper

- The NRC staff developed a white paper (ADAMS ML20195A270) to support discussions with ACRS and other stakeholders

- Soliciting information that:
  1) Defines the scope of stakeholder interest in a rulemaking to develop a technology inclusive framework for advanced nuclear reactors,
  2) Identifies major issues and challenges related to technology-inclusive approaches to licensing and regulating a wide variety of advanced nuclear reactor designs,
  3) Supports prioritizing and developing plans to resolve identified issues within the rulemaking for the wide variety of advanced nuclear reactor designs, and
  4) Supports the development of the proposed rule and related guidance.

- Staff receptive to feedback on any aspect of developing a technology-inclusive regulatory framework to support the regulatory objective, whether or not in response to a question listed in this white paper or future solicitations.

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Part 53 Rulemaking Objectives

1) Provide reasonable assurance of adequate protection of the public health and safety and common defense and security at reactor sites at which advanced nuclear reactor designs are deployed, to at least the same degree of protection as required for current-generation light water reactors;
2) Protect health and minimize danger to life or property to at least the same degree of protection as required for current-generation light water reactors;
3) Provide greater operational flexibilities where supported by enhanced margins of safety that may be provided in advanced nuclear reactor designs;
4) Ensure that the requirements for licensing and regulating advanced nuclear reactors are clear and appropriate; and
5) Identify, define, and resolve additional areas of concern related to the licensing and regulation of advanced nuclear reactors.

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Questions for Public Feedback

1. Regulatory Objectives: Are the regulatory objectives, as articulated above, understandable and achievable? If not, why not? Should there be additional objectives? If so, please describe the additional objectives and explain the reasons for including them.

2. Scope and Types of Advanced Nuclear Reactors: Should the scope of the rulemaking be limited to advanced nuclear reactors as defined in NEIMA or should the scope include all future applications for licenses, certifications, or approvals for commercial nuclear reactors regardless of design?

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Questions for Public Feedback

3. Technical Requirements versus Licensing Process: Should the framework focus only on those regulations related to technical standards (i.e., design, operational and programmatic requirements) and rely on the existing licensing processes in Parts 50 (e.g., construction permit and operating license) and 52 (e.g., early site permit, combined license, etc.) or should the framework develop a new alternative licensing process that looks different than the existing processes? If the latter, what should this new licensing process look like? Should this new process be "self-contained," such that it would provide its own licensing, procedural, administrative, and reporting requirements?

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Questions for Public Feedback

4. Performance Criteria: NEIMA calls for a technology-inclusive framework for advanced nuclear reactors, which encompasses a wide range of reactor technologies and power levels. To what extent should the NRC try to define a single set of performance criteria for all technologies and sizes (e.g., estimated offsite doses from postulated events), versus developing specific regulatory approaches for different categories of advanced nuclear reactors such as microreactors and fusion reactors?

Questions for Public Feedback

5. Risk Metrics: In a risk-informed performance-based regulatory regime, should risk metrics be included in the regulations? Possible examples of risk metrics include the quantitative health objectives described in the NRC's Safety Goals for the Operation of Nuclear Power Plants Policy Statement (51 FR 28004, Aug. 4, 1986, as corrected and republished, 51 FR 30028, Aug. 21, 1986) and the frequency-consequence targets described in SECY-19-0117, "Technology-Inclusive, Risk-Informed, and Performance-Based Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light-Water Reactors."

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Questions for Public Feedback

6. Facility Life Cycle: How could the new Part 53 licensing and regulatory framework align with the design, construction, operation, and decommissioning phases of an advanced nuclear reactor facility's life cycle?

7. Definitions: Should terms in the new Part 53 have identical definitions to terms in Parts 50 and 52? For example, SECY-19-0117 proposes to accept definitions for terms such as "safety related" and "design basis event" for non-light water reactors applications that differ from the definitions provided in 10 CFR Part 50. If possible, please provide alternative terminology for non LWR technologies.

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Questions for Public Feedback

8. Performance-Based Regulation: How should the requirements developed for this alternative regulatory framework incorporate performance-based concepts such as those described in NUREG/BR-0303, “Guidance for Performance-Based Regulation”?

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Questions for Public Feedback

9. Identifying Levels of Protection: Regulatory requirements in Parts 50 and 52 have been imposed as either needed to: 1) ensure a facility provides adequate protection to the health and safety of the public and is in accord with the common defense and security; or 2) provide a substantial increase in the overall protection of the public health and safety or the common defense in security when the costs of implementation are justified in view of the increased protection. Should specific requirements developed in this Part 53 rulemaking be identified as either needed to provide reasonable assurance of adequate protection or justified as cost-effective safety improvements?

Questions for Public Feedback

10. Integrated Approach to Rulemaking: In developing the requirements for this alternative regulatory framework, how can an integrated approach be developed to address areas such as safety, security, emergency preparedness, and other means to prevent or mitigate the potential release of radionuclides from an advanced nuclear reactor?

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Questions for Public Feedback

11. Consistency with Historical Standards: SECY-19-0117 describes a methodology that is meant to support the licensing process through identifying key safety functions, events that might challenge those functions, performance criteria for equipment and related programmatic controls, and defense in depth. The methodology uses risk-informed and performance-based criteria that are derived from existing regulations related to potential offsite doses and from the NRC's Safety Goal Policy Statement (51 FR 30028; dated August 21, 1986). Should this rulemaking use these existing criteria or should this opportunity be used to adopt or develop alternative criteria? If so, please describe possible alternatives and explain the reasons for using them within the regulatory framework being developed for advanced nuclear reactors.

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Questions for Public Feedback

12. Quality Assurance: Should quality assurance, as it is currently defined in Appendix B to Part 50, be a requirement in the new risk-informed, performance-based regulatory framework? Alternatively, should NRC regulations defer to internationally recognized, independent certification schemes for assessing quality processes at commercial nuclear facilities and at suppliers of equipment and services?

Questions for Public Feedback

13. Stakeholder Documents, Standards, Guidance: The NRC encourages active stakeholder participation through development of proposed supporting documents, standards, and guidance. In such a process, the proposed documents, standards, and guidance would be submitted to and reviewed by NRC staff, and the NRC staff could endorse them, if appropriate. Is there any interest by stakeholders to develop proposed supporting documents, standards, or guidance?

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Questions for Public Feedback

14. Other Issues: Are there significant issues, possible approaches, or other topics related to the initial crafting of a regulatory framework for advanced nuclear reactors that are not addressed in the above questions? If so, please identify the subject areas and, if possible, provide a suggestion on how the new framework could resolve the issue or incorporate a proposed approach.

Part 53 Rulemaking

QUESTIONS?

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Backup Slide – Integrated Approach