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UNITED STATES NUCLEAR REGULATORY COMMISSION'S  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

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678TH MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

OPEN SESSION

+ + + + +

THURSDAY

SEPTEMBER 10, 2020

+ + + + +

The Advisory Committee met via Video-  
Teleconference, at 9:35 a.m. EDT, Matthew W.  
Sunseri, Chairman, presiding.

COMMITTEE MEMBERS:

- MATTHEW W. SUNSERI, Chairman
- JOY L. REMPE, Vice Chairman
- WALTER L. KIRCHNER, Member-at-large
- RONALD G. BALLINGER, Member
- DENNIS BLEY, Member
- VESNA B. DIMITRIJEVIC, Member
- JOSE MARCH-LEUBA, Member
- DAVID A. PETTI, Member
- PETER RICCARDELLA, Member

1 ACRS CONSULTANT:

2 MICHAEL CORRADINI

3

4 DESIGNATED FEDERAL OFFICIAL:

5 ZENA ABDULLAHI

6 CHRISTINA ANTONESCU

7 CHRISTOPHER BROWN

8 CHRISTIANA LUI

9 QUYNH NGUYEN

10 DEREK WIDMAYER

11

12 ALSO PRESENT:

13 BOB BEALL, NMSS

14 MICHELLE CATTS, GE-Hitachi

15 AMY CUBBAGE, NRR

16 JOE DONOGHUE, NRR

17 MICHAEL DUDEK, NRR

18 RANI FRANOVICH, NRR

19 CHARLES HECK, GE-Hitachi

20 DAVID HINES, GE-Hitachi

21 NICHOLAS KLYMYSHYN, PNNL

22 SCOTT KREPEL, NRR

23 LOUIS LANESE, GE-Hitachi

24 RENEE LI, NRR

25 LISETTE MADALENA, Interpreter

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RYAN NOLAN, NRR

BRIAN PAINTER, Framatome

REBECCA PATTON, NRR

ANDREW PROFFITT, NRR

TOM SCARBROUGH, NRR

JOHN SEGALA, NRR

NANETTE VALLIERE, NRR

JENNIFER WAGNER, Interpreter

GEORGE WATKINS, GE-Hitachi

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C-O-N-T-E-N-T-S

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Spacer Grid Element" . . . . . 115

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

9:35 a.m.

CHAIR SUNSERI: Okay. I have 9:35. Good morning. This is Matt Sunseri. The meeting will now come to order.

This is the second day of the 678th meeting of the Advisory Committee on Reactor Safeguards. I'm Matthew Sunseri, the Chair of the ACRS. I'll now call the roll to confirm a quorum and that the members can have audio.

So, Ron Ballinger?

MEMBER BALLINGER: Here.

CHAIR SUNSERI: Dennis Bley?

MEMBER BLEY: Here.

CHAIR SUNSERI: Charles Brown?

MEMBER BROWN: Here.

CHAIR SUNSERI: Vesna Dimitrijevic?

MEMBER DIMITRIJEVIC: Here.

CHAIR SUNSERI: Walt Kirchner?

MEMBER KIRCHNER: Here.

CHAIR SUNSERI: Jose March-Leuba?

MEMBER MARCH-LEUBA: Yes.

CHAIR SUNSERI: David Petti?

MEMBER PETTI: Here.

CHAIR SUNSERI: Joy Rempe?

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1 VICE CHAIR REMPE: Here.

2 CHAIR SUNSERI: Pete Riccardella?

3 MEMBER RICCARDELLA: I'm here.

4 CHAIR SUNSERI: All right. So we have a  
5 full committee and all the audio sounds good and we  
6 have a quorum.

7 The designated federal official for this  
8 meeting is Mr. Derek Widmayer.

9 Today the Committee will consider several  
10 things including a Staff White Paper on 10 CFR 53,  
11 Advanced Notice of Proposed Rulemaking; GEH Topical  
12 Report on BWRX-300 Reactor Vessel and Overpressure  
13 Protection; Topical Report on Deformer Spacer Grid  
14 Element. And those will be technical presentations  
15 and then we will go into report writing in response to  
16 those reports.

17 We will be in and out of closed sessions  
18 throughout the day in order to protect information  
19 that is designated as sensitive or proprietary. We'll  
20 give the public an opportunity for comment prior to  
21 going into each closed session and we provide target  
22 times for when we will return to the open session  
23 following the closed session.

24 A phone bridge line has been opened to  
25 allow members of the public to listen in on the

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1 presentations and Committee discussions. We have  
2 received no written comments or requests to make oral  
3 statements from members of the public regarding  
4 today's sessions.

5 As I said, there will be opportunity for  
6 public comments and we've set aside time in the agenda  
7 for comments from members of the public attending or  
8 listening to our meetings. Written comments may be  
9 forwarded to Mr. Derek Widmayer, the designated  
10 federal official.

11 A transcript of the open portions of the  
12 meeting is being kept and it is requested that  
13 individuals addressing the Committee identify  
14 themselves and speak with sufficient clarity and  
15 volume so they can be readily heard. Additionally,  
16 participants that are not speaking should mute  
17 themselves to avoid distraction.

18 We have a full agenda today, as it is  
19 obviously showing, and I'm going to say that there's  
20 a strong possibility that we may need time that we  
21 have scheduled for Saturday morning to finish up some  
22 of these letter reports. I'm going to -- at this time  
23 I can't state for certain. We will judge this as we  
24 go, but I'm going to advocate that we do use that time  
25 to finish those reports this week as that will catch

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1 us up on our workload where we'll finally have the bow  
2 wave behind us and look forward to more levelized  
3 workload in our future Committee meetings.

4 So that decision is not made at this time,  
5 but I just want members to be thinking about that and  
6 I'd ask that staff consider they have the ability to  
7 support the Saturday should we decide to do that. And  
8 we'll decide either later today or early tomorrow.

9 So at this time I'll turn to the members  
10 and ask if there are any comments or questions before  
11 we get into the first session of the day. Members,  
12 comments or questions?

13 (No audible response.)

14 CHAIR SUNSERI: All right. So at this  
15 time I will turn to Member Bley who will be the lead  
16 for this session and on 10 CFR 53, Advanced Notice of  
17 Proposed Rulemaking, comments on staff paper.

18 Dennis?

19 MEMBER BLEY: Yes, thank you very much.  
20 We had a Subcommittee meeting on the Part 53  
21 rulemaking on July 20th of this year, and most of our  
22 members of the Full Committee attended, but not quite  
23 all. We informed the staff that we thought we would  
24 like to write a letter on this introductory meeting  
25 and be recommended back to the Full Committee. So

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1 here we are at Full Committee.

2 This will be a brief presentation of the  
3 materials from the previous meetings. And if there's  
4 anything new, I hope the staff will point that out,  
5 but I don't really expect it.

6 At this time I'm to turn it over to John  
7 Segala.

8 John, is that right?

9 MR. SEGALA: Yes, thank you, Dennis. Can  
10 you hear me?

11 MEMBER BLEY: Perfectly.

12 MR. SEGALA: Okay. Thanks. And good  
13 morning. I'm the Chief of the Advanced Reactor Policy  
14 Branch in the Office of Nuclear Reactor Regulation.  
15 And as you know, we're here today to brief you on a  
16 plan to develop a new technology inclusive risk-  
17 informed, performance-based regulation for advanced  
18 reactors, which we are calling 10 CFR Part 53, and to  
19 obtain insights and feedback from the ACRS Full  
20 Committee at this very early stage of developing this  
21 new framework.

22 Although we are expecting to leverage our  
23 ongoing readiness activities for this new rule, we are  
24 starting with a clean slate and looking for new and  
25 innovative ways to regulate advanced reactors.

1           As background back in 2017 we developed  
2 NRC's vision and strategy document and implementation  
3 action plans for enhancing our readiness to  
4 effectively and efficiently review and regulate  
5 advanced reactors. The IAPs included near-term, mid-  
6 term, and long-term activities. The near-term IAPs  
7 are divided up into six strategies: Strategy 1 on  
8 training; 2 on computer codes; 3 on developing  
9 guidance; 4 on industry consensus codes and standards;  
10 5 on policy issues; and 6 on communications. Back  
11 then the ACRS recommended that the NRC focus its near-  
12 term IAP activities on Strategies 3 and 5, which we  
13 have been doing.

14           The mid and long-term IAPs included a new  
15 activity to assess whether a new regulatory framework  
16 should be developed for advanced reactors, however, in  
17 January 2019 the Nuclear Energy Innovation and  
18 Modernization Act, or NEIMA, was signed into law and  
19 required that NRC complete this new regulation for  
20 advanced reactors by no later than the end of 2027.

21           On April 13th of 2020 we issued the  
22 rulemaking plan in SECY-20-0032, which is currently  
23 with the Commission for vote.

24           On July 13th we issued a Draft White Paper  
25 with questions on Part 53 to help facilitate

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1 discussions and obtain feedback from the ACRS  
2 Subcommittee on July 20th of 2020.

3 We are planning to have many interactions  
4 with the ACRS on Part 53 over the next year or so to  
5 continue to receive feedback. We're looking forward  
6 to hearing from the ACRS today on Part 53 and any  
7 insights and feedback you all may have.

8 And so this completes my opening remarks.  
9 Thank you.

10 MEMBER BLEY: Thanks, John. You're  
11 turning it over to someone I hope for the  
12 presentation.

13 MR. SEGALA: Okay. Yes, I'm going to turn  
14 it over to Nan Valliere of my branch to go through the  
15 presentation.

16 (No audible response.)

17 MR. SEGALA: Nan, are you still on mute?

18 MS. VALLIERE: I apologize. I was still  
19 on mute. Give me one moment to reset the slides here.  
20 I apologize.

21 Yes, good morning. As John mentioned, my  
22 name is Nan Valliere. I work in John's Advanced  
23 Reactor Policy Branch along with Bill Reckley, who  
24 made this presentation to the Future Plant  
25 Subcommittee in July, as has been mentioned.

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1           For those of you who don't know me, I've  
2           been with the NRC for 36 years spending my early  
3           career as an inspector and the remainder of my career  
4           working mainly in reactor licensing and policy  
5           development. But as you know, Bill Reckley is the  
6           brains behind the Part 53 project, so today you're  
7           getting the second string quarterback on Part 53.  
8           I'll do my best to channel Bill today who cannot be  
9           with us because he had a much deserved vacation  
10          planned.

11           Moving onto slide 2, John has gone over  
12          some of this background, so I'll try not to talk in  
13          too much detail about some of the items he's covered.

14           The last rulemaking effort in this area  
15          was the Advanced Notice of Proposed Rulemaking that  
16          was issued back in 2006 along with NUREG-1860,  
17          commonly known as the technology-neutral framework.  
18          More recently, as John mentioned, our vision and  
19          strategy document and the related implementation  
20          action plans had already identified a potential  
21          rulemaking to establish a regulatory framework for  
22          advanced reactors, even before the Nuclear Energy  
23          Innovation and Modernization Act, or NEIMA was  
24          enacted.

25           NEIMA directed us to do a rulemaking to

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1 establish a technology-inclusive framework for  
2 advanced reactors and to complete it no later than  
3 December of 2027. We are still waiting on the Staff  
4 Requirements Memorandum from the Commission on the  
5 Part 53 rulemaking plan which has the potential to set  
6 a different timeline for completion of the rule.

7 As the Committee is aware, Senator  
8 Barrasso and a number of other senators expressed a  
9 desire for us to accelerate the rulemaking, and the  
10 Commission its response said they would give the staff  
11 direction on the rulemaking schedule.

12 On slide 3 we lay out some definitions  
13 that were provided in NEIMA. First off, NEIMA defines  
14 an advanced reactor as a fission or fusion reactor  
15 including a prototype plant that has significant  
16 improvements compared to reactors that were under  
17 construction at the time of the Act. The Act lists  
18 those improvements in terms of proliferation  
19 resistance, safety, economics, fuel and other  
20 attributes. So we are setting the scope of the rule  
21 as light-water small modular reactors, non-light-water  
22 reactors and fusion reactors.

23 During the Subcommittee meeting the  
24 members asked the staff what we were going to do about  
25 fusion. Bill discussed that we haven't decided yet

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1 how to handle fusion, but we were considering  
2 different options including handling fusion facilities  
3 more like materials licensee facilities, like  
4 accelerators. As with everything else we'd be looking  
5 to use a risk-informed approach to addressing fusion  
6 facilities. This will be the subject of discussion at  
7 an upcoming workshop we will be having with the Fusion  
8 Industry Association, the Department of Energy and  
9 other stakeholders in early October. This slide also  
10 provides the other definitions within NEIMA, namely  
11 for a regulatory framework and a technology-inclusive  
12 framework as shown here.

13 Slide 4 provides a little more information  
14 about the Part 53 rulemaking plan. In that plan we  
15 told the Commission that we thought the goals of NEIMA  
16 could be best met by creating a new part in 10 CFR to  
17 start with a clean slate and try to construct  
18 something that would be suitable for a range of  
19 technologies. We plan to build on existing NRC  
20 requirements, Commission policy and recent related  
21 activities such as those described in SECY-19-0117 on  
22 our guidance for a technology-inclusive risk-informed  
23 and performance-based methodology for establishing the  
24 licensing basis for advanced reactors.

25 This is the guidance that was developed

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1 under the DOE Cost-Shared Licensing Modernization  
2 Project. The fourth bullet on this slide states that  
3 we're expecting extensive interactions with external  
4 stakeholders and with this Committee. I believe Bill  
5 discussed in the Subcommittee meeting that the staff  
6 is hoping to have frequent interactions with the ACRS  
7 throughout the development of the proposed rule.

8 We have been in touch with the ACRS staff  
9 to discuss when we might want to have our next  
10 interaction and we are tentatively scheduled to come  
11 back to the Subcommittee in January and would hope to  
12 meet about every other month thereafter. As I've  
13 mentioned, we are awaiting Commission direction on the  
14 ultimate schedule an rulemaking plan.

15 On slide 5 we have a slide that we have  
16 used in public meetings to talk about how we thought  
17 Part 53 might look. Although NEIMA does define the  
18 framework primarily in terms of licensing, we  
19 determined that if we are overly focused on the first  
20 step in the process, licensing, we're going to miss an  
21 opportunity to develop a more integrated approach.

22 Also, it's very difficult to talk about  
23 those first steps without having a good understanding  
24 of how the whole life cycle of the facility fits  
25 together. So in the rulemaking plan we propose to go

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1 beyond licensing and to build a whole regulatory  
2 framework from design through construction and  
3 operation and eventually to decommissioning.

4 A key early focus will be to clearly  
5 define the highest level safety or risk metrics. In  
6 other words, what are the fundamental safety  
7 functions? What are the key metrics at the current  
8 licensing criteria of 24 rem over the course of the  
9 event at the low-population cell.

10 There are other things like the NRC safety  
11 goals. How do they get worked in in terms of risk  
12 metrics? What about the use of something similar to  
13 the frequency consequence targets that are used in the  
14 guidance that came out of the Licensing Modernization  
15 Project?

16 And we envision we would also have  
17 regulatory requirements just like we do now on normal  
18 effluence. Once you're able to define the highest-  
19 level safety and risk metrics, the idea was that the  
20 rule would ask what is the role of the other parts of  
21 the life cycle in meeting those requirements? For  
22 example, during construction what testing do you do to  
23 make sure that the equipment actually has the  
24 capabilities that were intended to be built in at the  
25 functional or system level? During operations how are

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1 you managing configuration control, surveillance and  
2 maintenance? How are you controlling design changes?  
3 And then ultimately what needs to be done during  
4 retirement or decommissioning to maintain compliance  
5 with those requirements?

6 So now on slide 6 we are converting that  
7 figure into an outline of what Part 53 might look  
8 like. We would start with general provisions. All  
9 the regulations start off with those provisions that  
10 tell applicants and licensees, as well as the NRC  
11 staff and other stakeholders how the process works.

12 Then we would have a sub-part that would  
13 talk about safety objectives. What are the regulatory  
14 limits? How do the safety goals figure in? Those  
15 provisions would set out how safe the facility has to  
16 be.

17 And then we would go into the role of the  
18 design requirements, the role of siting and the role  
19 of construction and manufacturing in meeting those  
20 safety goals.

21 Then we describe the requirements for  
22 operation in terms of programmatic controls,  
23 requirements for configuration control, maintenance  
24 and surveillance.

25 And then what would be the necessary

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1 requirements to ensure safety is maintained during  
2 decommissioning?

3 And then we would have those sections of  
4 Part 53 related to licensing and maintaining the  
5 licensing basis information. Think of current  
6 sections such as 10 CFR Part 50.59 for control of the  
7 licensing basis and 10 CFR Part 50.71 for updating the  
8 final safety analysis report.

9 This is just one possible general layout  
10 and could help us guide how we might interact with the  
11 Committee starting with the safety objectives and then  
12 working our way through the outline.

13 MEMBER KIRCHNER: Nan?

14 MS. VALLIERE: Yes.

15 MEMBER KIRCHNER: This is Walt Kirchner.

16 MS. VALLIERE: Sure.

17 MEMBER KIRCHNER: Looking at the last two  
18 slides have you thought about; I'm looking at your  
19 bullet on certification, where that would fit in the  
20 life cycle of a 10 CFR 53 approach?

21 MS. VALLIERE: Yes, so with respect to the  
22 licensing process we've considered many options, one  
23 being do we just maintain the existing options in 10  
24 CFR Part 50 and Part 52? We will definitely maintain  
25 those options. The question is do we add anything in

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1 addition in Part 53, any new options or new ways of  
2 using the existing options? I will tell you that --

3 MEMBER KIRCHNER: It's a leading question  
4 in the sense that in the previous slide you show a  
5 life cycle and one -- I know -- I suspect; I don't  
6 know -- I suspect that many applicants would want to  
7 get -- try and have the certification up front, but  
8 when you look at a life cycle like this it suggests  
9 that certification probably shouldn't come until after  
10 you have operating experience for a first-of-a-kind  
11 plant.

12 MS. VALLIERE: Yes, understand.  
13 Understand. All very good questions, very good  
14 considerations. And unfortunately we don't have  
15 answers for that yet. I think as Bill mentioned  
16 during the Subcommittee we're still at the very  
17 beginning. So I think all of those things are being  
18 considered. It might be that for some very new  
19 designs we might need to come up with some new options  
20 and some new -- or some new twists to the existing  
21 options.

22 MEMBER BALLINGER: This is Ron Ballinger.  
23 Could a potential applicant -- could an applicant  
24 start off with a system which amounts to a prototype  
25 and then for the same plant convert that prototype to

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1 a non-prototype, a 104 versus 103? I forget the  
2 numbers. Could that happen?

3 MS. VALLIERE: So we have very specific  
4 requirements as to what has to be done for a prototype  
5 plant. Generally a prototype plant would usually have  
6 additional safety features if particular system  
7 functions or capabilities had not been demonstrated  
8 appropriately through testing or experimentation.  
9 Then there might be additional safety features on a  
10 prototype plant.

11 So if a prototype plant were constructed  
12 and licensed by the NRC and then those safety  
13 features, design features were proven through  
14 operation of the prototype plant, theoretically the  
15 licensee could then provide a demonstration that  
16 perhaps the plant could operate safely without some of  
17 those additional features that were added because it  
18 was a prototype plant, and such features might be able  
19 to be removed. And then one could say it's no longer  
20 a prototype plant. It's a --

21 MEMBER BALLINGER: Yes, okay. I guess I'm  
22 getting the numbers wrong. I guess there's a 104  
23 versus 103.

24 MS. VALLIERE: Right.

25 MEMBER BALLINGER: Yes, so conversion from

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1 one to the other is theoretically possible?

2 MS. VALLIERE: Well, the prototype plant  
3 doesn't necessarily fall in one category or the other.

4 MEMBER BALLINGER: Okay.

5 MS. CUBBAGE: This is Amy Cubbage. Could  
6 I chime in? So the prototype provisions would be  
7 under Part 50 or 52 for a combined license or an  
8 operating license under 103. So there wouldn't need  
9 to be a conversion. However, as Nan indicated, if  
10 there were special features that a licensee wanted to  
11 remove, they could ask for a license amendment to  
12 change the facility, but you won't have to convert the  
13 license. There would also be potential scenarios  
14 where the extra provisions may be just license  
15 conditions where certain testing needs to be completed  
16 to demonstrate operation perhaps for a longer time or  
17 at a higher power level. And once those license  
18 conditions were fulfilled the facility would just  
19 continue as a normal OL or COL.

20 MEMBER BALLINGER: Okay. Thanks.

21 MEMBER PETTI: So can I ask a question  
22 along that line? You mentioned the need for  
23 additional safety features in the design to compensate  
24 for the lack of operating experience. I really think  
25 more definition in the prototype may be helpful.

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1           For instance, if you were to put the  
2 prototype at one of the national labs where one is far  
3 from the public, is that distance considered a safety  
4 feature?

5           MS. CUBBAGE: Yes, historically we have --  
6 this is Amy Cabbage, NRC staff, again. Historically  
7 one of the features of a prototype could be siting  
8 away from populations. It could be conditions upon  
9 testing that needs to be fulfilled or it could be  
10 physical features, however we've not exercised this  
11 provision. And we have developed some guidance on  
12 prototype testing in general that I could provide a  
13 reference to the ACRS staff.

14           MEMBER PETTI: So, Amy, yes, I think I  
15 have that.

16           MS. CUBBAGE: Okay. Great.

17           MEMBER PETTI: I didn't know if it had  
18 been updated, if it -- it looks like it's just like a  
19 White Paper. Is it going to become something more  
20 official?

21           MS. CUBBAGE: We didn't have any plans in  
22 the near term, however I would expect as part of the  
23 Part 53 rule if there are any new or different  
24 provisions that there would be guidance available as  
25 part of the rulemaking, just kind of speculating on

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1 that.

2 MEMBER BALLINGER: Hi, this Ron again. I  
3 don't think I have that information.

4 MS. CUBBAGE: I'd be happy to provide that  
5 to Derek.

6 MEMBER BALLINGER: Great.

7 MS. CUBBAGE: Okay.

8 MEMBER PETTI: So my view is that the  
9 prototype is viewed as an extra hill to climb by these  
10 -- some of these concept developers, yet you're stuck  
11 with some systems that have never been built before.  
12 The prototype seems like the natural way to go. And  
13 if it could be shown that it's actually faster,  
14 easier, it gets you to construction; which is really  
15 what they want, earlier and then you kind of delay  
16 some of the safety stuff until operation, it might  
17 make it look more attractive to them. And I think  
18 that's important.

19 MR. SEGALA: This is John Segala from NRC.  
20 I think I agree 100 percent with what you're saying.  
21 I think some of the down sides that -- if a developer  
22 is looking to build multiple reactors, they -- the  
23 prototype for the first would delay their ability to  
24 move forward on the second one. And so I think that  
25 depending on the business model that a developer is

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1 considering it may make -- if they're just planning to  
2 build one and then wait, a prototype could potentially  
3 get them there much quicker. But if they're planning  
4 to build one and then very quickly after that a second  
5 and a third and fourth, the prototype may not fit what  
6 they're looking for.

7 MS. CUBBAGE: Yes. However, on the flip  
8 side if there is a lengthy test program underway, it  
9 could be a faster way to get the first facility built,  
10 so definitely acknowledging what you're saying there.

11 MEMBER BALLINGER: Yes, I mean I keep --  
12 this is Ron again. I keep using the analogy for the  
13 Boeing 777. In the earlier designs they built  
14 multiple what I would call prototypes and stuff, but  
15 for the 777, because of the advancements in technology  
16 and modeling and simulation, they built the first one  
17 and used it for certification and then sold it to a  
18 customer. So it's in effect converting a prototype  
19 into an operating unit.

20 MEMBER KIRCHNER: But, Ron, as I suggested  
21 that was a very evolutionary design much like an  
22 advanced LWR, not a non-LWR. And I would submit that  
23 the 787 had multiple prototypes.

24 MEMBER BALLINGER: The 787 was a plastic  
25 airplane. The 777 was an aluminum airplane.

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1 MEMBER KIRCHNER: No, but that's the  
2 point. The change in technology was so significant,  
3 Ron, that they actually had more than one prototype  
4 for the 787.

5 MEMBER BALLINGER: Yes. Yes.

6 MS. CUBBAGE: So not to derail this great  
7 conversation, but I think these conversations are more  
8 relevant to perhaps the current framework and how we  
9 would implement it today. And it's really premature  
10 at this point for us to speak to any details on how we  
11 will or won't have a prototype provision in the future  
12 Part 53, so we could definitely come back and talk  
13 about this at a future meeting.

14 MEMBER BLEY: We would like that. I'd  
15 like to go back to something Nan said and Amy ended  
16 at.

17 Nan, you said you expect Part 53 to offer  
18 all the licensing options that are in both 50 and 52,  
19 and I just wanted to say the ones that I remember and  
20 then see if that matches what you're saying.

21 That would include early site permits,  
22 construction permits, operating licenses, design  
23 certs, standard design approvals and combined  
24 licenses? Is that right, or is there more?

25 MS. VALLIERE: Manufacturing licenses in

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1 Part 52 and then of course the two-step construction  
2 permit operating licensing in Part 50.

3 MEMBER BLEY: Thank you.

4 MS. VALLIERE: Okay. So are we ready to  
5 continue?

6 MEMBER BROWN: No. No. This is Charlie  
7 Brown. I had a question. I may have asked this in  
8 the Subcommittee, but I don't remember.

9 In the White Paper -- let me back up for  
10 a second. When you went to Part 52, there's a section  
11 of Part 52 which says all the general design criteria,  
12 all the Part 50 stuff in the appendices apply for a  
13 Part 52 application.

14 In the White Paper, on page 3 actually,  
15 right above the discussion you talk about current  
16 regulations are found in 50 and 52. And this  
17 rulemaking is expected to create or -- yes, in keeping  
18 with the vision and strategy.

19 In the discussion the first sentence says  
20 the rulemaking would establish alternative regulatory  
21 requirements that could be used for applicants. And  
22 then you go into the routine stuff about risk-  
23 informed, performance-based methods that are flexible.  
24 I read that is -- maybe I'm reading it wrong -- is  
25 that the GDCs as we know them and have known them are

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1 going to be dismissed. Are they going to be reframed?  
2 Or has that been taken into consideration in terms of  
3 how you develop 53?

4 MS. VALLIERE: Yes, so, Charlie, you did  
5 raise this in the Subcommittee meeting and so --

6 MEMBER BROWN: Thank you.

7 MS. VALLIERE: -- I'm going to tell you  
8 exactly what Bill told you then.

9 MEMBER BROWN: Okay.

10 MS. VALLIERE: So we don't -- basically  
11 there are going to be something akin to general design  
12 criteria, but at a much higher level, at a fundamental  
13 safety function level, for example in the first  
14 section of the life cycle. So what Bill told you was,  
15 yes, there will be similar types of requirements.  
16 Those will more likely be imbedded in the actual body  
17 of the regulation itself rather than as an appendix as  
18 they currently are in Part 50.

19 Again, because this is a technology-  
20 inclusive framework the fundamental safety functions  
21 or design criteria have to be written at a high enough  
22 level that multiple technologies could use them. And  
23 then of course we have existing -- some existing  
24 guidance documents on the advanced reactor design  
25 criteria. So those and perhaps other guidance that

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1 might be developed within Part 53 could be used to  
2 guide applicants to develop their applications.

3 MEMBER BLEY: Nan, this is Dennis. I do  
4 remember that and as part of the vision and strategy  
5 process we've been going through with you we reviewed  
6 your paper on the advanced reactor design criteria,  
7 which were to meet some of what you just said, but  
8 they weren't -- with a couple exceptions they were not  
9 at substantially higher levels in the current GDCs.  
10 Are you still -- are those still in your picture or  
11 are you thinking of something much higher level than  
12 we saw in the ARDCs?

13 MS. VALLIERE: So I think the rule will be  
14 written at a higher level than perhaps than you saw in  
15 the ARDCs, but I would expect that the ARDCs could be  
16 used as further guidance under the rule.

17 MEMBER BLEY: Okay. So rather than right  
18 now where the GDCs are an appendix and we're at that  
19 deep level, the rule you see is higher? Okay.

20 MS. VALLIERE: Yes.

21 MEMBER BLEY: Thank you.

22 MEMBER KIRCHNER: Nan, while we're --

23 MS. VALLIERE: Yes?

24 MEMBER KIRCHNER: -- this is Walt  
25 Kirchner. While we're on that related topic, what are

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1 your thoughts about quality assurance requirements?

2 MS. VALLIERE: Yes, so we know that  
3 quality assurance requirements is going to be a hot  
4 topic within Part 53. As you'll see in the next few  
5 slides we have a specific question on quench  
6 survivability laid out in our White Paper and we do  
7 intend it to be a topic of discussion at the first  
8 public meeting we're having later this month. So we  
9 are -- have an open mind are looking at alternatives  
10 to Appendix B and things that exist today and are  
11 hoping to provide alternatives under the Part  
12 framework.

13 MEMBER KIRCHNER: Well, just I think about  
14 -- maybe I should pursue that and just say why do you  
15 need alternatives to what's a well-accepted, well-  
16 developed standard?

17 MS. VALLIERE: Well, I'll just say that we  
18 often get questions related to international standards  
19 and other quality assurance standards that could be  
20 used to provide an equivalent level of quality to what  
21 we might see under Appendix B but provide more  
22 flexibility.

23 MEMBER KIRCHNER: I would presume that  
24 when you go to a higher level in the actual rule than  
25 say the advanced GDCs that are in the Reg Guide, then

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1 you would tie those higher-level requirements to a  
2 quality assurance program.

3 MS. VALLIERE: Yes, that's the vision now  
4 that the -- the quality assurance requirements would  
5 sort of be built in again in the body of the  
6 requirements we're going to lay out for each phase of  
7 the life cycle.

8 MEMBER KIRCHNER: Yes. Thank you.

9 MS. VALLIERE: Sure.

10 MEMBER BLEY: Nan, this brings up a  
11 question of processing the rulemaking for me. We had  
12 -- we wrote a letter on the paper on the ARDCs. If  
13 that's going to end up, and possibility something like  
14 that ends up as guidance, what's the sequencing of  
15 having guidance to support the rule and the rule  
16 itself? Will they be done in parallel? Will see  
17 guidance or will the rule come forward with a promise  
18 of guidance to come later?

19 MS. VALLIERE: Yes. No, the Commission  
20 laid out some years ago direction to the staff that  
21 whenever a rulemaking was undertaken that the staff  
22 would present draft guidance along with the proposed  
23 rule at the same time, both to the Commission and then  
24 to be put out for public comment. And then the staff  
25 would provide final guidance at the time the final

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1 rule was provided to the Commission and the guidance  
2 would be issued with the final rule. So we would  
3 expect that the guidance and the rule would be moving  
4 in parallel.

5 MEMBER BLEY: That makes a lot of sense  
6 and it's comfort to the process. Have you started  
7 compiling any kind of list of what guidance you think  
8 you'll need and when might we see such a list?

9 MS. VALLIERE: I'll say we have a mental  
10 list at this point in time. And I also want to note  
11 that part of our thinking is that some of the guidance  
12 that is being developed today to aid advanced reactor  
13 applicants under the existing framework will also be  
14 very useful under Part 53. So for example, the  
15 guidance that was developed under the Licensing  
16 Modernization Project and is now endorsed in a  
17 Regulatory Guide we believe will be useful for  
18 applicants who eventually request applications under  
19 Part 53.

20 We're also -- the industry and the NRC  
21 staff are working on guidance for the content of  
22 applications that goes hand in hand with the Licensing  
23 Modernization Project guidance. I believe Bill spoke  
24 about that a little bit in the Subcommittee meeting.  
25 It's called -- the industry project is the Technology-

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1 Inclusive Content of Application Project. That is  
2 focused on constructing the parts of an application  
3 that would essentially form the safety case or be  
4 needed to undertake the Licensing Modernization  
5 Project definement of the licensing basis events and  
6 the classification of safety structure systems and  
7 components.

8 And then the NRC staff is undertaking a  
9 broader project that encompasses TICAP that's called  
10 the Advanced Reactor Content of Application Project,  
11 and that guidance would add on all of the other parts  
12 of an application that would be necessary. And so  
13 pieces of guidance like that along with guidance that  
14 was developed for the new emergency preparedness rule,  
15 guidance that's being considered for new siting  
16 requirements, those types of things would all be  
17 useful for us in Part 53.

18 MEMBER BLEY: That's a great list and I  
19 just wanted to mention that neither me nor I think  
20 even you know for sure how fast this schedule is going  
21 to be pushed. We're going to ask you again about  
22 this. And I think that catalog ought to get refined  
23 as early as possible into a list of the guidance you  
24 expect to have, because you can't paste that stuff  
25 together near the end of the process.

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1           Somebody else had a question.

2           MR. SEGALA:   And, Dennis, this is John  
3 Segala. I just wanted to add that similar to what we  
4 did for LMP, in addition to coming to talk to you all  
5 on a frequent basis on Part 53 we also plan to come  
6 and talk to you about TICAP and ARCAP and get your  
7 feedback on that aspect as well.

8           And to the extent that we get accelerated  
9 on the rulemaking it's going to make it even more  
10 important for us because of the less time to leverage  
11 this -- these ongoing activities that we're working on  
12 to develop guidance to the extent they make sense for  
13 this new regulation. So we do plan to have a lot of  
14 engagement with you all over the next year or so.

15          MEMBER BLEY:   Thanks, John. For the  
16 members who weren't at the Subcommittee meeting can we  
17 give a real brief explanation of TICAP and ARCAP so  
18 they know what you're talking about?

19          MR. SEGALA:   Yes, so Nan kind of alluded  
20 to it, but TICAP is Technology-Inclusive Content of  
21 Application Project. It's DOE cost-shared, NEI-  
22 coordinated, and southern-led activity. They're  
23 basically going to take the output of an application  
24 that uses the Licensing Modernization Project where  
25 you're going to identify the events, classify the

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1 system structures or components and ensure adequate  
2 defense-in-depth. And TICAP is going to provide a  
3 methodology that developers can use to take the output  
4 of LMP and use that to provide the appropriate level  
5 of information in an FSAR that would be submitted to  
6 the NRC.

7 And then ARCAP, the Advanced Reactor  
8 Content of Application, would go beyond the scope of  
9 TICAP, would encompass TICAP and would look at those  
10 chapters that would not be an output of the Licensing  
11 Modernization Project such as liquid/solid rad waste,  
12 things like that. And we would provide guidance for  
13 the level of detail and information that would go into  
14 an application or an FSAR for those portions of the  
15 application.

16 So with the combination of TICAP and ARCAP  
17 an applicant -- and these would just be one acceptable  
18 way that an applicant could use to assemble their FSAR  
19 to submit to the NRC. And we're looking to make this  
20 technology-inclusive risk-informed and use  
21 performance-based approaches.

22 MEMBER BLEY: So a lot of stuff to fit  
23 together in a short time --

24 MR. SEGALA: Yes.

25 MEMBER BLEY: -- like what kind of

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1 participation between -- these are industry programs  
2 I think, but you folks are closely involved with them  
3 in this development?

4 MR. SEGALA: Yes, so we're having monthly  
5 meetings now with industry on both ARCAP and TICAP.  
6 So we're really turning up the game to engage so that  
7 we can move forward on those projects in the time  
8 frame that it's looking like we're going to need to.

9 MS. CUBBAGE: Yes, and this is Amy Cabbage  
10 again. To answer your question, the ARCAP portion is  
11 staff-led.

12 MEMBER BLEY: Oh, okay. I missed that.  
13 Go ahead, Nan.

14 MS. VALLIERE: Okay. Moving onto slide 7.  
15 In this slide we start to discuss the staff's White  
16 Paper that was issued just before our Subcommittee  
17 meeting in July. The most important thing is that we  
18 start to engage stakeholders as soon as possible and  
19 this White Paper was seen as a vehicle for beginning  
20 that engagement, both internally and externally.

21 We want to determine where stakeholder  
22 interests lie and what challenges they see so we can  
23 set out a plan as to how we're going to talk through  
24 the various issues. We hope stakeholders agree to  
25 work with us throughout the development of the

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1 proposed rule so that we don't spend a lot of time  
2 coming up with a finished product only to have  
3 stakeholders tell us they don't think that it's  
4 workable.

5 As we were just talking about we're also  
6 interested in the related guidance that might be  
7 appropriate for the rule and we'd like to gauge  
8 whether there are stakeholders that are interested in  
9 supporting development of such guidance.

10 Slide 8 lists the rulemaking objectives  
11 that were included in our rulemaking plan. The first  
12 two pretty much go without saying: Basically that we  
13 -- the objective is to maintain the same level of  
14 protections as exist for the operating fleet. The  
15 third one goes to what the Commission told us most  
16 recently in the Staff Requirements Memorandum for  
17 SECY-19-0117 that was on the Licensing Modernization  
18 Project guidance.

19 This concept was also discussed in an  
20 older SECY paper from 2010, and that is that the  
21 expectation is that the attributes listed in the  
22 Advanced Reactor Policy Statement, things like less  
23 vulnerability to accidents, increased thermal margins,  
24 slower responses leading to releases -- that those  
25 would get translated into operational flexibilities.

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1 And you might think of flexibilities like reduced  
2 emergency planning zones, relaxed population-related  
3 siting controls and other items like that.

4 And then No. 4 and 5 are just trying to  
5 make sure the proposed rule is developed such that  
6 it's clear and it addresses known areas of concern.

7 Slides 9 and 10 list the topics of -- yes?

8 MEMBER KIRCHNER: Nan, could you go back  
9 one slide? This is Walt Kirchner.

10 MS. VALLIERE: Certainly.

11 MEMBER KIRCHNER: I'm just struck by  
12 bullet No. 2 there. That's different language than is  
13 in the safety goals or the Advanced Reactor Policy  
14 Statements. I'm just curious why now we're protecting  
15 health and minimizing danger to life.

16 MS. VALLIERE: So I believe that language  
17 is directly from the Act itself.

18 MEMBER KIRCHNER: Oh, that's -- okay.

19 MS. VALLIERE: Yes.

20 MEMBER KIRCHNER: Because I don't  
21 recognize that language in any of the Advanced Reactor  
22 Policy Statements or the safety goals.

23 MS. VALLIERE: Yes.

24 MEMBER KIRCHNER: Thank you.

25 MS. VALLIERE: Certainly. Slides 9 and 10

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1 list the topics of the questions in the White Paper at  
2 a high level. Bill walked through each of the  
3 questions in detail during the Subcommittee meeting in  
4 July and today I did not intend to walk through each  
5 question again but wanted to note that these are the  
6 areas where we will be seeking feedback during our  
7 public meetings, the first of which is being scheduled  
8 for September 22nd.

9 So the paper includes a question on the  
10 scope of the regulatory objectives which we just went  
11 over, the type of advanced reactors that the  
12 rulemaking would cover, whether the focus would be on  
13 technical requirements or a licensing process, or  
14 both, what --

15 MEMBER BLEY: Nan?

16 MS. VALLIERE: Yes?

17 MEMBER BLEY: Will any of these public  
18 meetings be webcast?

19 MS. VALLIERE: Yes.

20 MEMBER BLEY: I'm sorry?

21 MS. VALLIERE: Yes.

22 MEMBER BLEY: Okay. That's good to know.  
23 We'll try to track them.

24 MS. VALLIERE: I'm sorry, by webcast you  
25 -- they will be virtual meetings, but I don't believe

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1 they're going to be recorded, if that's what you're  
2 asking.

3 MEMBER BLEY: Well, I kind of was, but we  
4 could listen into them.

5 MS. VALLIERE: So Bob Beall is on the  
6 line, I believe.

7 Bob, can you confirm that there will be a  
8 transcript?

9 MR. BEALL: Hi, this is Bob Beall. I'm  
10 the rulemaking PM for Part 53. The public meetings  
11 will have -- will be all transcribed. And we'll be  
12 using Webex. So just like you see today any of the  
13 presentations from the staff or any of the industry or  
14 other participants that want to make a presentation  
15 will be shown to all parties during the public  
16 meeting.

17 MEMBER BLEY: Do you also have some kind  
18 of minutes or just a transcript?

19 MR. BEALL: No, we'll have also a meeting  
20 summary for each of the meetings we have.

21 MEMBER BLEY: Okay. And they'll be public  
22 and easy to get to?

23 MR. BEALL: That's correct. Yes, sir.  
24 We'll make sure they're in ADAMS and we also put them  
25 on regulations.gov.

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1 MEMBER BLEY: Okay. Thanks.

2 MS. VALLIERE: Continuing through the list  
3 then, the performance criteria, risk metrics, a  
4 question about how to incorporate the facility life  
5 cycle into Part 53, questions on definitions. In  
6 other words, should we use the existing definitions in  
7 Parts 50 and 52 or perhaps create new definitions  
8 under Part 53? How to incorporate performance-based  
9 concepts into Part 53, whether we should identify  
10 different levels of protections, how we can facilitate  
11 an integrated approach to the rulemaking, to integrate  
12 safety, security, emergency preparedness, consistency  
13 with historical standards like the use of the safety  
14 goals, quality assurance requirements as we were  
15 discussing earlier. Again we're going to seek  
16 stakeholder interest in preparing guidance, helping us  
17 to prepare guidance and then ask if stakeholders have  
18 any other issues they would like to raise.

19 For the public meeting on September 22nd,  
20 we've grouped these questions into six broader  
21 categories for discussion. And after getting feedback  
22 on this broad range of topics we intend to focus our  
23 first efforts on developing the requirements for the  
24 overarching safety criteria. Our goal is to plan our  
25 next public meeting around a discussion of those

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1 criteria and we intend to draft and release  
2 preliminary rule text before that meeting and  
3 hopefully before our next meeting with the Committee.

4 With that I'll stop here and ask if there  
5 are any comments related to any of the specific  
6 questions or any of the other topics we've discussed  
7 here today.

8 MEMBER KIRCHNER: Nan, this is Walt  
9 Kirchner again. Just an observation rather than a  
10 question. One of your topics I think is going to be  
11 extremely important. I don't want to sound like a  
12 library, a bookkeeper or something, but -- a  
13 librarian, but definitions are going to loom very  
14 important in your work. I'll give an example of why  
15 I think this is the case. And the example would be  
16 out of the definition for safety-related SSCs.

17 Now the definition that's in 10 CFR 50  
18 starts with basically saying those systems that are  
19 relied on to remain functional during design-basis  
20 events -- and the list that is in the current  
21 regulation, which I'm sure you know; and I'll just  
22 summarize it, is integrity of the reactor coolant  
23 pressure boundary, capability to shut down the reactor  
24 and maintain safety shutdown conditions and the  
25 capability to prevent/mitigate releases. And then

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1 that gets us to your dose criteria that are in 10 CFR  
2 50 and 52.

3 I suspect given that definition an  
4 applicant can come in and say, well, it doesn't apply  
5 to me. I don't have a reactor pressure coolant  
6 boundary. I'm not a pressurized system and such. So  
7 it suggests perhaps that that definition should be  
8 modified to include whatever vessel is used to retain  
9 the core.

10 So I just throw that out as an example of  
11 how important that will be because then once you write  
12 a regulation you'll use shorthand in the sense that  
13 you'll say safety-related, and that definition will be  
14 critical, and then evaluating the system and the need  
15 for whatever level of quality for the systems that are  
16 part of the design. So it's more an observation, but  
17 I just -- I suspect the definition part is going to be  
18 very important.

19 MS. VALLIERE: Yes, I would agree with you  
20 and the subject of definition comes up in almost every  
21 conversation we have about Part 53 and developing  
22 guidance for advanced reactors. So I couldn't agree  
23 with you more. It's going to very important and  
24 something that we're going to have to focus on very  
25 early on because it will underpin pretty much

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1 everything that we do going forward in Part 53.

2 MR. SEGALA: Yes, and this is John Segala.  
3 I just wanted to add that this was a big area of  
4 interest when we were briefing the ACRS on the  
5 Licensing Modernization Project because it used  
6 similar terminology with different definitions,  
7 safety-related being one of them. And, yes, we do  
8 need to make sure that we have things well defined so  
9 there's a common understanding when we use the  
10 shorthand what we're actually referring to. So I  
11 agree with the observation.

12 CHAIR SUNSERI: Nan, this is Matt Sunseri.  
13 I had two observations I'd like to bring up here, and  
14 I think you alluded to one -- the first one as you  
15 were talking about your preparation for the public  
16 meeting, but I think when I look across the 14  
17 questions I see an opportunity to combine some topics.

18 As you think about your presentations with  
19 us and our interactions going forward I think it would  
20 be important to do that, to combine the areas that  
21 make sense and then to prioritize those so that  
22 they're presented to the Committee in the right  
23 sequence. Because what we've found before is  
24 sometimes you have a meeting scheduled and say, okay,  
25 what do we have put together that we can present and

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1 it doesn't come off good because it's out of sequence  
2 and then we get bogged down because the prerequisite  
3 information is not available or what have you.

4 So I would just commend to you that --  
5 having them prioritized and presented in the right  
6 sequence so that it builds on each other to a  
7 conclusion I think is the most effective way I've seen  
8 things get through the Committee. That's just an  
9 observation.

10 And then the second topic -- any question  
11 about that?

12 MS. VALLIERE: No, I just wanted to point  
13 out that, yes, we are doing just that in the public  
14 meeting and we've taken it down to six topic areas,  
15 which I can certainly share with the Committee. If  
16 the Committee has a preference -- I mean we will  
17 obviously have some ideas about sequence, but if the  
18 Committee has a preference, obviously we would be  
19 interested in hearing that.

20 CHAIR SUNSERI: Yes, I think that's  
21 something that you guys can work out with the  
22 Subcommittee, which will be Dennis, and figure that  
23 out.

24 MS. VALLIERE: Certainly.

25 CHAIR SUNSERI: The second thing I had,

1 just an observation from experience is I know you're  
2 looking at what the requirement -- what you've been  
3 asked to do I guess it the licensing -- the framework  
4 for the -- the regulatory framework for the licensing  
5 aspect of these advanced reactors, and you're putting  
6 that in the context of the facility life cycle. And  
7 I get that. It makes sense to me, but I would ask you  
8 to think about -- there are activities in that life  
9 cycle that as you're thinking about that could I'm  
10 going to say bog down or be contentious and then might  
11 be tracked from the overall goal of giving a rule on  
12 the regulatory framework for the licensing activities.

13 So think about your project from a -- what  
14 off-ramps would you have for the non-essential pieces  
15 of what you're trying to accomplish so that you can  
16 get through the essential parts of it in whatever  
17 accelerated time frame that the SRM is going to impose  
18 on you. That's all I had. Thanks.

19 MS. VALLIERE: Yes, that's very good  
20 advice and one we will definitely take to heart. We  
21 realize that depending on the schedule we get we might  
22 not be able to do all things in the first go-around,  
23 so we will definitely be focusing on the priorities.

24 MEMBER BROWN: This is Charlie Brown. I  
25 have just an observation, I guess, related to my

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1 comment or question back in the Subcommittee as well  
2 as the one I repeated here, which you answered for me.

3 When we get down to brass tacks, I'm very  
4 interested in the general design criteria. That's  
5 just important to me, and it has been in the past. If  
6 you look, all these plants, no matter what they are,  
7 are going to have to be started up, shut down and  
8 monitored during all their operations. That takes  
9 control systems.

10 I just took a quick look at the GDCs for  
11 the area that I primarily look at most of the time and  
12 most of them are very, very general. They are not  
13 technology-exclusive in any way, shape or form. And  
14 I guess the only thing I would expect when we get down  
15 to the final nitty-gritty is that there has been some  
16 type of a comparison between what exists for Part 50  
17 and 52 and how those new general design criteria would  
18 be -- how they'd be rephrased or reused. There's an  
19 awful lot of history and wealth in the existing GDCs.  
20 There are some that are obviously very targeted.  
21 Light water reactors, period. No questions. But a  
22 large number of them, in fact a majority of them are  
23 general enough, with taking a few things out, that  
24 they would apply even to advanced reactors of any --  
25 under this process that we're talking about.

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1           So I guess I would expect downstream that  
2 we'd see a comparison between whatever general design  
3 criteria or however you phrase them in a comparison  
4 back and how they were reworked, eliminated or what  
5 have you as part of the overall review process. And  
6 that's just an observation, something I would expect  
7 to see. That's all I had from this.

8           MS. VALLIERE: Understand. Thank you.  
9 Thank you for that comment.

10           Any other questions or comments?

11           MEMBER DIMITRIJEVIC: Well, I have a  
12 question when it comes to definition. This is Vesna  
13 Dimitrijevic. I was wondering in one of your  
14 questions actually -- well, that -- this is my  
15 question: How do you define risk-informed as a part  
16 of your process here? When you say this is risk-  
17 informed, technology-inclusive, blah, blah, blah. So  
18 what in your mind when you say risk-informed -- you --  
19 is your thinking? What's the definition of risk-  
20 informed here? That's my question.

21           MS. VALLIERE: I will just say that I view  
22 risk-informed as imposing requirements commensurate  
23 with the level of risk of the given facility. So in  
24 other words, we have large light water reactors, we  
25 have research and test reactors, we are going to have

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1 advanced reactors that fall in between those types of  
2 reactors and that the goal is to impose requirements  
3 of a scope and depth commensurate with a level of risk  
4 presented by the facility which the applicant is  
5 seeking a license for.

6 MEMBER DIMITRIJEVIC: Okay. Well, this is  
7 why I'm asking you, because you have under your  
8 questions for feedback is -- No. 5 is related to risk  
9 metrics, to include risk metrics in regulation or not.  
10 So I was wondering can you have a risk-informed  
11 approach without including these metrics? That's my  
12 question.

13 MS. VALLIERE: It would be difficult,  
14 very, very difficult to have a risk-informed approach  
15 without risk metrics, but I guess if you asked someone  
16 to define what a risk metric was, you might get a lot  
17 of different folks giving you different definitions.  
18 So we're interesting in drawing those kind of  
19 responses.

20 MEMBER DIMITRIJEVIC: I know. I know,  
21 there are a lot of issues with that. I just wondering  
22 how would risk-informed approach look without these  
23 metrics. Would be very interesting.

24 MS. VALLIERE: Yes, I agree.

25 MR. SEGALA: Yes; and this is John Segala,

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1 I think as we were going through and looking at the  
2 Licensing Modernization Project, because of the nature  
3 of the non-light water reactor designs not having  
4 necessarily surrogates and things that -- like core  
5 damage frequency and large early release we had to go  
6 to something more technology-inclusive looking at the  
7 actual consequences at a distance. And so these are  
8 all things that when you go technology-inclusive and  
9 you have designs where the fuel is already melted, you  
10 have to really think differently. So we are open to  
11 ideas and thoughts of the best way to be risk-informed  
12 and have metrics that work and make sense.

13 MEMBER DIMITRIJEVIC: Well you know one of  
14 the challenging things even for this advanced light  
15 water reactor or even larger is that the question is  
16 if you discuss risk-informed application, you always  
17 looking the delta and increasing the risk related to  
18 the application.

19 So here they tried to preserve the risk to  
20 all of the licensing plate -- operating plant. So the  
21 question is if you're having risk-informed  
22 applications and you looking increasing the risk,  
23 obviously in this spot this would not be related to  
24 the operating fleet. And so now a question is what do  
25 you try to preserve in the risk-informed application?

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1 What -- are you trying to preserve increased level of  
2 safety of the coolant level of safety? I mean there  
3 is so many challenging questions in that area.

4 And that's why I sort of brought up  
5 because right here we see that we are trying not to  
6 impose the higher expectation of the new plants than  
7 existing fleet. But here I mean this will be  
8 completely different. Maybe the risk-informed will be  
9 related to preserving higher level of that protection.  
10 So this is just my thoughts on the subject.

11 MR. SEGALA: This is John Segala. I think  
12 the Commission has made it clear to us that we should  
13 hold these new non-light water reactor designs to the  
14 same level of safety that we have for the existing  
15 fleet.

16 MEMBER DIMITRIJEVIC: The same level of  
17 safety?

18 MR. SEGALA: Or equivalent level of  
19 safety.

20 MEMBER DIMITRIJEVIC: Okay. Well, I was  
21 thinking that we will be changing this expectation,  
22 but okay.

23 MEMBER BLEY: Any other question from the  
24 Committee?

25 MEMBER KIRCHNER: Yes, Dennis, this is

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1 Walt again. Sorry. One more observation kind of  
2 question, and I'm reflecting just on our most recent  
3 Subcommittee meeting.

4 This observation, Nan, is just that often  
5 what we see in the regulatory reviews is a boxology  
6 that goes something along the lines -- it's like a  
7 four-box matrix and it's safety-related and not  
8 important to safety and important to safety and so on  
9 and so forth. And there seems to be in that boxology  
10 some large degree of variability or subjectivity and  
11 different terminologies thrown around by -- I  
12 shouldn't make it sound so casual -- different  
13 terminology used by staff in their reviews.

14 Have you thought any about that use of  
15 that kind of approach and whether there could be a  
16 standardized accepted framework within -- maybe this  
17 is at a lower level, but within 10 CFR 53? Do you --

18 MS. VALLIERE: Yes, so this gets to a  
19 couple of issues, back to the issue of terminology,  
20 but also the boxology you're referring to. And I  
21 remember the specific matrix for 50.69. In my view a  
22 lot of that was borne out of the fact that we had an  
23 existing largely deterministic regulatory framework.  
24 And then we were trying to bring risk-informed  
25 considerations into that framework, and that led you

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1 in many cases to the four boxes.

2 With the staff starting sort of from  
3 scratch in Part 53 we don't have sort of the force-fit  
4 that you had under the current framework. And so I  
5 think we are going to be able to come up with a much  
6 more I will say smooth framework as far as the  
7 relationship between risk and safety. And that's  
8 already been undertaken to some degree under the  
9 guidance that resulted from the Licensing  
10 Modernization Project. And so I think we're going to  
11 carry that philosophy forward in Part 53.

12 Yes, so I assure you we are thinking about  
13 this and our goal is not to make it overly complicated  
14 and to make it clear as to where things fit and why  
15 they fit there.

16 MEMBER KIRCHNER: Thank you.

17 MEMBER BLEY: Any other questions from the  
18 Committee?

19 (No audible response.)

20 MEMBER BLEY: I guess at this time I  
21 should ask if there are any comments from the public  
22 listening in.

23 Could we open the phone line?

24 And if there's anybody on this Skype call  
25 who wants to make a comment, please do so at this

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1 time.

2 (No audible response.)

3 MEMBER BLEY: It sounds like the phone  
4 line is open. Is there anybody on the phone line who  
5 would like to make a comment? Identify yourself then  
6 make your comment.

7 (No audible response.)

8 MEMBER BLEY: Hearing none, I will hand it  
9 back to your chairman.

10 Mr. Chairman, we only have 45 minutes  
11 until the end of the proposed end of this session. We  
12 could start our discussion if you'd like, but I don't  
13 know if there's time to make that worthwhile. Back to  
14 you.

15 CHAIR SUNSERI: Yes, thanks. You said 15  
16 minutes, right? We have 15 minutes left?

17 MEMBER BLEY: Yes.

18 CHAIR SUNSERI: Yes. So I mean I think it  
19 would be worthwhile to at least get started on that.  
20 I don't think we should use the 15 minutes as a -- and  
21 constrain us from coming back to it later, but yes, I  
22 would think you -- so let me be a little bit more  
23 coherent here.

24 So what Dennis would like to do for this  
25 -- for us -- preparation for this letter is go back to

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1 some basics in our letter writing where we'd have a  
2 focused discussion, if you will, where we solicit  
3 feedback from all the members and that -- even our  
4 consultants on what are the major topics that we  
5 should consider in our letter report and our feedback  
6 to the staff on this topic? And then once that is  
7 done, Dennis and whoever he chooses can go prepare the  
8 letter report for us.

9 Is that the approach you want to take on  
10 this, Dennis?

11 MEMBER BLEY: That's correct. And if  
12 we're going to do that, I wonder if Derek could put up  
13 my discussion point notes?

14 CHAIR SUNSERI: Yes, so let's do that.  
15 Let's get those discussion points up there and at  
16 least get those in front of the Committee, and then  
17 perhaps you could walk us through that. And that  
18 might take us up to the 11:00 hour.

19 MEMBER BLEY: Okay. Well, if I can go  
20 ahead, I -- while he's getting it up I sent these  
21 discussion points to all the members. I hope everyone  
22 got them; a few people had problems. I also sent a  
23 draft letter, but that's really linked to the way I  
24 put up the comments. So I'll do the introduction at  
25 least.

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1 I went through the transcript from the  
2 Subcommittee meeting and I got a few comments since  
3 then that I've added in my own notes that aren't on  
4 your discussion point notes. So I'll just read the  
5 introduction.

6 At this time before the staff has  
7 developed language to support Part 53, should this  
8 letter be focused on one or two key issues we want  
9 them to consider be a catalog of everything we want to  
10 see? When the staff came to us for the Subcommittee  
11 they really weren't asking for a letter. They were  
12 just giving us an opening introduction, but there were  
13 enough issues that were raised and things people  
14 talked about that almost all members of the  
15 Subcommittee wanted us to write at least a brief  
16 letter at this time.

17 And the first paragraph, sort of paragraph  
18 on my notes that had come up, the first two bullets  
19 are kind of where I stand. I think because we're  
20 going to have a whole series of meetings and get into  
21 great depth that this really ought to focus on just a  
22 very limited number of issues and be a fairly short  
23 letter. And we don't need to reiterate the  
24 conclusions from our previous letters on the -- our  
25 vision and strategy. We're going to have a lot of

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1 chances for that.

2 I had two, and I added one that I should  
3 have thought of, issues to include in the letter and  
4 they were -- the one the staff in the rulemaking plan  
5 to the Commission included a request to bypass the  
6 usual regulatory basis document. I think we ought to  
7 say something about that.

8 No. 2, a number of people in this meeting  
9 and in preparation for some of the new designs that  
10 are either applied or about to apply and have  
11 submitted topical reports brought to our attention the  
12 idea that they really need to start to look for design  
13 -- regulatory-basis events design-basis events from a  
14 clean sheet of paper. Think through the accidents  
15 that need to be considered without the bias of what's  
16 happened in the past.

17 And the existing guidance for current LWRs  
18 in the SRP don't do that. They give you starting  
19 points. The LMP guidance and the PRA standards don't  
20 really get at this part either. They give you some  
21 really broad guidance on initiating events, but now  
22 how to come up with them. So we wanted to say  
23 something on that.

24 And the one that's not on the list I sent  
25 to you is consideration of prototypes on your sort of

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1 substantial needed information and very limited if any  
2 operating experience. And I think those were the two  
3 big ones I wanted to include.

4 Now I have a whole list of things that  
5 you've had a chance to look through including a quote  
6 from the Subcommittee meeting from an outside party.  
7 But at this point I would open it up for discussion.  
8 Anything on that whole list is open for discussion and  
9 for inclusion in the letter. It was just my opinion  
10 that it ought to be short and focus on those three  
11 things I mentioned: the no regulatory-basis document,  
12 the clean sheet of paper and the prototype.

13 But I know there are other issues very  
14 close to a number of us. So the floor is open for  
15 discussion.

16 MEMBER PETTI: So, Dennis?

17 MEMBER BLEY: Yes?

18 MEMBER PETTI: I may be in the minority  
19 here and I'd be happy to put it in as additional  
20 comments, but this discussion about fusion and whether  
21 fusion power plants are an accelerator is an old  
22 argument by proponents who do not want to understand  
23 the reality of fusion power plants, since I spent half  
24 my career in it and didn't know the safety standard.  
25 So I have a paragraph that I drafted to explain why

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1 fusion power plants are a lot closer to fission power  
2 plants than they are to accelerators.

3 That may not rise to the level of a full  
4 letter, but if we put it in in added comments, it  
5 would at least be on the record to help NRC at least  
6 have a counter-argument, because I've been in those  
7 meetings with that community and they just don't -- I  
8 mean they see this as a -- they see licensing of a  
9 fusion reactor as a big hurdle in their technology and  
10 they don't want to go there. But there are facts that  
11 can't be disputed.

12 MEMBER BLEY: You have not circulated your  
13 notes on that?

14 MEMBER PETTI: No, I just was putting my  
15 together this morning.

16 MEMBER BLEY: Okay. Well, I don't think  
17 we can really go through that now, but I think once  
18 you have your notes, we'll see --

19 MEMBER KIRCHNER: Dennis?

20 MEMBER BLEY: Let me finish. We'll see if  
21 the majority of the Committee would like to adopt that  
22 at this time or we join you in your added comments, in  
23 which case we ought to have it in the letter. So  
24 maybe we can have that discussion later, but I suspect  
25 I agree with you.

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1           Go ahead whoever wanted to talk.

2           MEMBER KIRCHNER:   Dennis, this is Walt.  
3           I just wanted to say that I agree with Dave, which  
4           might put us in a position different than what we just  
5           heard from the staff with regard to fusion reactors.

6           MEMBER BALLINGER:   This is Ron.   I know  
7           that there's an upcoming -- is it a public meeting in  
8           October on the fusion side?

9           MEMBER BLEY:   I don't know.

10          MEMBER BALLINGER:   I think there is.  
11          There's some -- I got an invite and I think it was  
12          mentioned in their introduction today.

13          MEMBER BLEY:   If we can stop for a moment,  
14          Ron, let's ask them.

15          Is Nan still on the line?  Can you address  
16          that?

17          MS. VALLIERE:   Yes, I'm still here.  Yes,  
18          I believe it -- and John Segala may --

19          MR. SEGALA:   Yes.

20          MS. VALLIERE:   -- correct me, I believe  
21          it's a public workshop.  Is it or is it not?

22          MR. SEGALA:   This is John Segala.  It is  
23          a public forum on October 6th.

24          MS. VALLIERE:   Yes, it's the NRC, DOE and  
25          the Fusion Industry Association.

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1                   MEMBER BLEY: Thank you. We'll note that.  
2                   Maybe we can get somebody to listen in, or some of us  
3                   might.

4                   Ron, go ahead.

5                   MEMBER BALLINGER: No, that's what I was  
6                   about to say with respect to the fusion reactors. So  
7                   if for example Dave, who is obviously much more  
8                   knowledgeable than a lot of us are, were to listen in  
9                   on that thing, he might get some insight that is up --  
10                  is at least up to date on the fusion community's part.

11                  MEMBER BLEY: Okay. I think that sounds  
12                  good. And Dave's point makes sense to me, but I'd  
13                  like to see his paper, because we haven't talked about  
14                  this at all. And so if we can have a discussion on  
15                  that -- Dave, if you have them ready -- whenever you  
16                  get them ready if you can send them around to  
17                  everyone, I think that would help when we get back to  
18                  this discussion.

19                  This is going to end in just a few  
20                  minutes, so who else wants to chime in on some key  
21                  things they want us to be thinking about?

22                  MEMBER BROWN: Dennis, it's Charlie. Am  
23                  I breaking up again or is it me?

24                  MEMBER BLEY: Yes, you are.

25                  MEMBER BROWN: Try it now.

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1 MEMBER BLEY: Go ahead.

2 MEMBER BROWN: I just wanted to -- I think  
3 somehow we -- at the clean sheet of paper thing I  
4 always worry when I see the words clean sheet of paper  
5 on everything, and you -- that's your first -- up in  
6 your beginning part of your discussion points  
7 somewhere.

8 I think we need to emphasize that we  
9 shouldn't throw out the baby with the bath water. I  
10 agree that there's a lot of areas where obviously or  
11 so the old GDCs are so explicit that they're not  
12 appropriate for going forward in this more flexible  
13 environment, but there are a large number of them that  
14 are pretty generic and are on issues that we would --  
15 you would have to carry forward into any other types  
16 of new design. I think we ought to include some type  
17 of comment in your letter relative to that thought  
18 process, that we ought to at least make --

19 MEMBER BLEY: You want to say something  
20 about the GDCs?

21 MEMBER BROWN: Yes.

22 MEMBER BLEY: Okay. The clean sheet of  
23 paper is really applying to dreaming up the accidents  
24 you have to worry about. And if you start with a  
25 pretty known list, it's really hard to expand that.

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1 That's what the folks have been saying: When you want  
2 to start thinking about them, think about them without  
3 preconceptions and go back and look at whatever  
4 historical information you have and make sure you  
5 haven't dropped something that you should have kept.

6 MEMBER BROWN: Yes, but --

7 (Simultaneous speaking.)

8 MEMBER BLEY: -- the presupposed list,  
9 it's real hard to think broadly.

10 MEMBER BROWN: If you look at the couple  
11 of the advanced designs that we've seen, trying to  
12 brainstorm what accidents that you have to protect  
13 against are kind of hard. It's -- thinking about some  
14 of those, they're pretty much out in the -- much  
15 different approaches to how you do stuff. And really  
16 -- any of these new designs you really need to have a  
17 complete thought process that goes through and looks  
18 at that. I agree with you from that standpoint. And  
19 the LWR ones don't carry over into a couple of these.

20 MEMBER BLEY: Charlie, when you talk about  
21 GDCs you -- I may be over-interpreting this, you seem  
22 to forget that we wrote a letter on the advanced  
23 reactor design GDCs that -- the ARDCs.

24 MEMBER BROWN: Yes.

25 MEMBER BLEY: Which is supposedly going to

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1 be at least a basis for their thinking as they go  
2 forward. So they're not starting cold on that one.

3 Who else wants to make --

4 MEMBER BROWN: I wasn't sure that was how  
5 that was going to be slipped into what we're doing  
6 now.

7 MEMBER BLEY: Okay. Anybody else? We're  
8 down to the last seconds here.

9 MEMBER MARCH-LEUBA: Yes, this is Jose.  
10 I'd like to support Dennis' position on that second  
11 bullet that it is the design-basis events that have to  
12 be looked at with a clean sheet and then compare  
13 against NUREG-0800. Just supporting you.

14 MEMBER BLEY: Thank you. I suspect we  
15 ought to quit now, Matt.

16 CHAIR SUNSERI: Yes. That's good.

17 MEMBER BLEY: We look forward to coming  
18 back. If anybody has more thoughts, send them to us.

19 And, Matt, if you -- well, never mind.

20 CHAIR SUNSERI: So we can -- thank you,  
21 Dennis. We will consider this to be the end of that  
22 discussion. When we get back into it, we can reengage  
23 on this and make sure that you've got all the  
24 information you need from the Committee to go forward  
25 with the letter.

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1 All right, members. It is 11:00 almost.  
2 We are at a point here where we are scheduled for a  
3 break and a transition. So we will take a 15-minute  
4 break right here and we will reconvene at 11:15 in  
5 open session to start with the GE Topical Report on  
6 the BWRX-300. And Jose will be our lead on that one.  
7 So break until 11:15. Thank you.

8 MEMBER MARCH-LEUBA: Hey, Matt, stay on  
9 the line a moment.

10 CHAIR SUNSERI: Yes, sir.

11 MEMBER MARCH-LEUBA: Yes, okay. I'm not  
12 sure we have enough time to read the letter at the end  
13 in the closed session --

14 CHAIR SUNSERI: Yes.

15 MEMBER MARCH-LEUBA: -- but once again I  
16 wanted to at least show it on the screen so then we  
17 can send them -- send GE a copy and they have a couple  
18 of hours to review it for proprietary. That was my --

19 CHAIR SUNSERI: Yes, so they have not  
20 reviewed it for proprietary yet? Okay.

21 MEMBER MARCH-LEUBA: No, they have not  
22 because we had to figure out what the process is.  
23 I've been told that unless it's shown on the screen we  
24 cannot send it to them. So that's my plan. Okay?

25 CHAIR SUNSERI: Okay. So we'll have the

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1 -- we'll go into closed session, we'll do the closed  
2 session presentation, we'll read -- we'll put your  
3 letter up on the screen and that will give GE the  
4 opportunity to do a proprietary review at that point  
5 in time.

6 MEMBER MARCH-LEUBA: Okay. Thank you.

7 CHAIR SUNSERI: Okay.

8 MS. ABDULLAHI: Hi, this is Zena. Should  
9 I send it now to GE?

10 MEMBER MARCH-LEUBA: No, you cannot send  
11 it now because it's not being shown publicly. We need  
12 to figure out the process.

13 CHAIR SUNSERI: So it's not going to be  
14 shown publicly in the open session, right? I mean --  
15 or I'm sorry, in the closed session it's not going to  
16 be public either because it still hasn't had a  
17 proprietary review.

18 MEMBER MARCH-LEUBA: Yes, we can not put  
19 it on the open session, but once we put it in the  
20 closed ACRS session, it's already on the record.

21 CHAIR SUNSERI: Okay. Yes, yes, yes.  
22 Yes, yes. I know what you're saying. I know what  
23 you're saying. We do need to think about this process  
24 a little bit. Okay. Thank you, Jose. I got you.

25 (Whereupon, the above-entitled matter went

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1 off the record at 11:01 a.m. and resumed at 11:15  
2 a.m.)

3 CHAIR SUNSERI: Okay, members and  
4 participants, it's 11:15, I'm going to call the member  
5 roll call, starting with Ron Ballinger.

6 MEMBER BALLINGER: Here.

7 CHAIR SUNSERI: Dennis Bley. Dennis Bley?  
8 Charles Brown?

9 MEMBER BROWN: Here.

10 CHAIR SUNSERI: Vesna Dimitrijevic?

11 VICE CHAIR REMPE: Matt, recall that Vesna  
12 said she had to be away some of today for other  
13 reasons, maybe that's why she's not answering.

14 MEMBER BLEY: Dennis is here.

15 CHAIR SUNSERI: Vesna is going to be  
16 tomorrow's, what -- okay, you're right, Vesna's  
17 absent. Okay, I'm sorry. Walt Kirchner?

18 MEMBER KIRCHNER: Here.

19 CHAIR SUNSERI: And I did hear Dennis was  
20 on. Jose March-Leuba?

21 MEMBER MARCH-LEUBA: I'm here.

22 CHAIR SUNSERI: Dave Petti?

23 MEMBER PETTI: Here.

24 CHAIR SUNSERI: Joy Rempe?

25 VICE CHAIR REMPE: Here.

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1 CHAIR SUNSERI: Pete Riccardella?

2 MEMBER RICCARDELLA: I'm here.

3 CHAIR SUNSERI: And myself. So we have  
4 everyone except Vesna, and Vesna has an excused  
5 absence at this point. So we can go forward with the  
6 introductions, and I'll turn to Member March-Leuba.

7 MEMBER MARCH-LEUBA: Yeah, I see George  
8 just showed up as a guest, so he is in the right  
9 place. So let's start the meeting.

10 We have a Subcommittee meeting on this  
11 same topic, on BWRX-300, is the GEH, new advanced  
12 concept for a boiling water reactor. And we are going  
13 to hear an introduction about how the reactor looks  
14 like. And the primary topic of our presentation is  
15 the review of a topical report on overpressure  
16 protection.

17 I want to thank GE for their advice. They  
18 have moved, I guess, all the presentations exclusively  
19 to the open sessions so the public can be informed  
20 about what we are -- our regulations and what they are  
21 doing. So I thank you for that. Unless somebody else  
22 wants something, we are going to start a presentation  
23 with opening remarks from NRC, Mike Dudek.

24 MR. DUDEK: So, thank you. Before George  
25 hops on with the presentation, I just wanted to take

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1 a minute and thank you, Chairman Sunseri and  
2 Responsible Committee Member Jose March-Leuba, for  
3 your time today.

4 The NRC staff has, as well as GEH, taken  
5 the Committee's -- Subcommittee's recommendations into  
6 account, and put a lot more information into the  
7 public section, knowing that a lot of this information  
8 is proprietary. I think the majority of the detailed  
9 discussions associated with how and what we review  
10 still remains in the closed session, but we will have  
11 a -- the NRC will also have a pretty lengthy  
12 discussion in the open session.

13 So we have taken that into account, we  
14 have heard you, and we look forward to the discussions  
15 today. So thank you for the opportunity.

16 MEMBER MARCH-LEUBA: Thanks, Mike. So  
17 we're ready GE's presentation. Remember, this is the  
18 open session, no proprietary information here.  
19 George, who's going to share the screen?

20 MR. WATKINS: This is George Watkins from  
21 GEH. I'll be sharing the screen. I believe before we  
22 -- before I start, though, that Michelle Catts will  
23 make a brief introduction.

24 MS. CATTS: Okay, good morning. My name  
25 is Michelle Catts, I'm the Senior Vice President of

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1 Nuclear Programs at GE-Hitachi. Can you hear me all  
2 right?

3 CHAIR SUNSERI: Yes, yes, ma'am.

4 MS. CATTS: Okay, great, thanks.  
5 Presenting with me today are our BWRX-300 Licensing  
6 Manager, George Watkins, and one of the principal  
7 designers, David Hines.

8 On behalf of our entire team, we do want  
9 to thank the ACRS for the invitation to introduce our  
10 small modular reactor, the BWRX-300, and our first  
11 licensing topical report for this reactor on reactor  
12 pressure vessel isolation and overpressure protection.

13 At GE we've been in the nuclear industry  
14 from the onset, and we've been developing new nuclear  
15 technology for decades. We focused on large  
16 lightwater reactors, but we also believe that small  
17 modular reactors will play an important role in our  
18 future for carbon-free energy.

19 The BWRX-300 is a safe and simple design.  
20 It was established using a rigorous design-to-cost  
21 approach. It is the tenth generation of boiling water  
22 reactor, and that's what the X stands for in BWRX-300.  
23 And we scaled it down from the ESBWR, which is  
24 licensed by the NRC.

25 In summary, the mission of the BWRX-300 is

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1 to develop a simplified reactor design with world-  
2 class safety that is cost-competitive in the current  
3 energy environment, and be operational by 2027. NRC  
4 approval of our design is critical to achieving our  
5 mission, and the ACRS participation in this process is  
6 an important aspect of that approval.

7 Our licensing strategy includes  
8 substantial pre-application engagement with the NRC  
9 staff, including submittals of a number of licensing  
10 topical reports, the first of which is in front of you  
11 today. During the presentation today, we're going to  
12 detail the BWRX-300 design and the ulterior specifics.  
13 We look forward to the discussion and we thank you for  
14 your time.

15 So I will now turn it over to George  
16 Watkins to go through the agenda on Slide 3.

17 MR. WATKINS: Good morning, my name is  
18 George Watkins, and I'm am the BWRX-300 Licensing  
19 Manager for GE-Hitachi.

20 Today, GE-Hitachi will be presenting an  
21 overview of the BWRX-300 small modular reactor design  
22 and a brief description of the content of the  
23 licensing topical report MEDC-33910P, BWRX-300  
24 reaction pressure vessel isolation and overpressure  
25 protection.

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1 MEMBER MARCH-LEUBA: George, this is Jose,  
2 sorry to -- is somebody going to show the slides? We  
3 expected you to do it on your side.

4 MR. WATKINS: Hold on. I probably didn't  
5 hit the right button. Can you see my slides now?

6 MEMBER MARCH-LEUBA: Now it's loading. It  
7 always takes a minute. Okay, I can see your slide.  
8 Continue.

9 MR. WATKINS: Okay, thank you. Sorry  
10 about that, the button I needed to hit, boom.

11 Okay, so here on Slide 3, this shows the  
12 agenda for today's presentation. This includes the an  
13 overview of the BWRX design, the purpose and scope of  
14 the licensing topical report, the technical evaluation  
15 of the design requirements, and the acceptance  
16 criteria for the design features related to BWRX-300  
17 reactor pressure vessel isolation and overpressure  
18 protection fundamental safety functions, and the  
19 regulatory evaluation demonstrating this with NRC  
20 regulatory requirements and conformance to NRC  
21 regulatory guidance.

22 At the end, we will have a session for  
23 closing remarks and questions, and at which time we  
24 could also take any proprietary questions or provide  
25 additional proprietary information in the closed

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1 session.

2 So with that, I will now turn over the  
3 presentation to David Hines, Principal Designer of the  
4 BWRX-300. He will provide an overview of the BWRX-300  
5 design and evolution from the previous nine  
6 generations of General Electric BWR technology.

7 MEMBER MARCH-LEUBA: I cannot hear  
8 anything, are you muted?

9 MR. HINES: Hi, this is David Hines, can  
10 you hear me now?

11 MR. WATKINS: Okay, yeah, we can hear you  
12 now, David.

13 MR. HINES: Okay, I'm sorry, I was muted.  
14 So just a very brief overview of the design of BWRX-  
15 300. And beginning with the evolution, as was  
16 mentioned before, we're -- evolutionary design, we  
17 basically have the benefit of the lessons learned of  
18 prior generations of boiling water reactors.

19 As you can see on the chart, we have --  
20 we're showing the fourth circulation fleet of boiling  
21 water reactors, so at the green line, and on the blue  
22 or purple line a natural circulation evolution as  
23 well.

24 The most recent design preceding the BWRX-  
25 300, as can be here, is the ESBWR of the technology

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1 development program from the SBWR, the remaining are  
2 our natural circulation fleet. That natural  
3 circulation fleet benefits from operating experience  
4 from the Dodewaard reactor, shown on the left of the  
5 chart.

6 The BWRX-300 largely uses concepts,  
7 licensing, and technology development most recently  
8 from ESBWR, but in a smaller fashion. If we could  
9 move to the next slide, please?

10 Okay, so this shows a cutaway of the  
11 reactor pressure vessel for the BWRX-300. And for  
12 those of you who were part of the review of ESBWR, or  
13 are familiar with ESBWR technology, there's much  
14 similarity. The BWRX-300 is 300 megawatts nominal  
15 electric generation. So a smaller version of the  
16 approximately 1520-megawatt electric ESBWR.

17 The reactor pressure vessel uses similar  
18 technology and fabrication methods, though we changed  
19 the pressure rating to add some additional margin.  
20 The chimney shown in the center of the figure, very  
21 key to a natural circulation plant.

22 The chimney is the region allowing for the  
23 natural circulation, such that we'd had the gravity  
24 head of water of on the liquid side, downcomer on the  
25 outside of the chimney barrel, and the steam flow path

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1 on the inside of the chimney. Which, that region is  
2 just at the core exit, with showing the core down  
3 below. And we're pointing, the arrow pointing there  
4 indicates GNF2 fuel.

5 So those of you familiar with ESBWR, we  
6 used a shorter fuel design for ESBWR to minimize the  
7 differential pressure in the flow path for the natural  
8 circulation plant. With continued fuel development  
9 and with development of BWRX-300, we found that our  
10 standard GNF2 fuel is, works very well for the BWRX-  
11 300. So we're able to use a proven fuel product out  
12 of our current manufacturing line of GNF2.

13 Control rods, very similar to the current  
14 operating fleet and the fine motion control rod  
15 drives, similar to the ABWR and ESBWR technology.  
16 Steam separators and dryer, very similar to the  
17 existing fleet.

18 So this is just giving you a very quick  
19 deep-dive into where the technology came from. So we  
20 did -- we've done some sizing changes, but in many  
21 cases the technology was pulled forward. We will talk  
22 on some of the upcoming slides about the different  
23 concepts used for mitigation of postulated pipe  
24 breaks.

25 George, that's it for that slide.

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1 MR. WATKINS: Okay, thank you, David.  
2 Okay, moving on, on Slide 8, we describe the purpose  
3 and scope for the licensing topical report, including  
4 design requirements, acceptance criteria, and  
5 regulatory basis for the BWRX-300 reactor pressure  
6 vessel isolation and overpressure protection design  
7 functions.

8 For a reactor pressure to ensure  
9 isolation, this includes design requirements for the  
10 reactor pressure vessel for RPV oscillation valves.  
11 These valves function to close to limit the loss of  
12 coolant from large and medium pipe breaks to  
13 effectively mitigate the consequences of loss of  
14 coolant accidents, or LOCAs.

15 In addition, the design requirements for  
16 the isolation condenser system, or ICS, are described.  
17 The ICS removes the K heat from large, medium, and  
18 small pipe breaks; it additionally mitigates the  
19 consequences of LOCAs. In evaluating the consequences  
20 of LOCAs, GE-Hitachi proposed a specific BWRX-300  
21 acceptance criteria to bound the regulatory acceptance  
22 criteria from 10 C.F.R. 3.46(b).

23 As a result of the BWRX-300 design  
24 features, some design features required for the  
25 mitigation of LOCAs in previous generations of boiling

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1 water reactors, or BWRs, including the most recently  
2 certified ESBWR, or economically simplified boiling  
3 water reactor, has been eliminated, resulting in a  
4 simplified but safe design for the BWRX-300.

5 Finally, the licensing topical report  
6 describes the NRC regulatory requirements, including  
7 these that are shown on this slide, and then again on  
8 Slide 8.

9 Slide 9 further describes the design  
10 requirements, acceptance criteria, and the regulatory  
11 basis for the BWRX-300 reactor pressure vessel  
12 overpressure protection design function.

13 This includes describing design  
14 requirements for a reactor protection system, or RPS,  
15 and ICS with providing overpressure protection,  
16 justifying elimination of some of the design features  
17 required for overpressure protection in previous  
18 generations of BWRs, including the ESBWR and  
19 compliance with regulatory requirements also for this  
20 slide.

21 Slide 11 describes the general  
22 introduction to the BWRX-300 strategy by a simple  
23 sequence driven by natural phenomena and the  
24 mitigation of the consequences of LOCAs. The  
25 mitigation of LOCAs utilizes the inherent margins

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1 built into the system down the runoff, including  
2 reduction in number and size of the nozzles relative  
3 to the top of active fuel.

4 There are several design features in the  
5 reactor that maximize efficient inventory during  
6 LOCAs. This includes the large RPV volume tied to a  
7 new region. Reactor water level is maintained at or  
8 above top of active fuel, or the fuel cladding sensor  
9 is maintained at the normal operating temperature  
10 range. Following offerings involving feed water flow  
11 interruptions or LOCAs. So --

12 MEMBER MARCH-LEUBA: This is Jose --

13 MR. WATKINS: Yes, go ahead, Jose.

14 MEMBER MARCH-LEUBA: The previous  
15 statement, does it mean -- does this mean that you  
16 have already run some preliminary accident analysis  
17 vis-a-vis the results of this, or does this represent  
18 your acceptance criteria?

19 MR. WATKINS: This is discussing the  
20 acceptance criteria, but we have run quite a few  
21 sensitivity analyses to demonstrate to ourselves that  
22 the design will function to meet this -- there's more  
23 criteria than the regulatory requirements would  
24 require.

25 MEMBER MARCH-LEUBA: So this is not an

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1 aspirational goal, but is your full expectation based  
2 on your preliminary analysis.

3 MR. WATKINS: That is correct.

4 MEMBER MARCH-LEUBA: Okay, thank you.

5 MR. WATKINS: So, yes, in final design, we  
6 fully expect to meet this criteria with no issues.

7 Okay, the RPV isolation valves included in  
8 the design limit the loss of coolant from the large  
9 and medium use. The heat from reactor is ejected to  
10 the isolation condenser heat exchangers, located  
11 within large pools of water. The IC cools outside of  
12 containment and above the containment area.

13 The most likely sources of loss of coolant  
14 for a lightwater reactor eliminated by use of the  
15 BWRX-300 simple safety systems. This is further  
16 described in the LTR, mainly proprietary-type  
17 information, though.

18 So moving on, slide 12 describes and shows  
19 a depiction of the BWRX-300 RPV. It consists of that  
20 pressure vessel, removable head, the pertinent uses  
21 supports and insulation, and the reactor internals.  
22 The vessel is relatively tall, promoting the natural  
23 circulation driving forces required to produce  
24 abundant core coolant flow. And increased internal  
25 flow pathway relative to core circulation BWRs is

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1 provided by the chimney in the space that expands or  
2 extends from the top of the core to the entrance of  
3 the steam generators.

4 The chimney and steam generator assembly  
5 are supported by drive assembly that extends down to  
6 the top of the core. So these are the primary  
7 features to ensure we have sufficient core flow  
8 promoting natural circulation, both during normal  
9 operation and also assisting in flow following  
10 anticipated operational occurrences and design-basis  
11 accidents.

12 Slide 13 describes and shows the depiction  
13 of a BWRX-300 isolation condenser system. The ICS  
14 passively removes heat from the reactor following  
15 several events. Any sudden reactor isolation at power  
16 operating conditions, station blackout, unavailability  
17 of alternate current power, anticipated transit  
18 without scram events, and loss of coolant accidents.  
19 It's initiated automatically on indications of an RPV  
20 overpressure event, or on other signals indicating a  
21 loss of coolant accident.

22 The isolation condenser coolant installed  
23 capacity provides approximately seven days of reactor  
24 decay removal capability.

25 MEMBER MARCH-LEUBA: I have a question.

1 MR. WATKINS: Yes.

2 MEMBER MARCH-LEUBA: Okay, the seven days  
3 satisfies the rule and the requirements, but do you  
4 anticipate being able to refill the ICS, and do you  
5 anticipate the need of something equivalent to the  
6 flex power supplies that other reactors have? I mean,  
7 after seven days, what happens?

8 (Simultaneous speaking.)

9 MR. WATKINS: Yeah, after seven days,  
10 yeah, after seven days, we would have several methods  
11 to refill the IC pool. David Hines, can you provide  
12 some additional information on that?

13 MR. HINES: Yes, that's correct, we do  
14 have installed systems to allow for refill, and then  
15 we additionally have some capability for flexible,  
16 portable equipment refill if necessary. But we have  
17 substantial decay heat removal installed with the  
18 reactor, as George indicated.

19 MEMBER MARCH-LEUBA: Yeah, eventually, we  
20 see in a year or two when we see the final design,  
21 we'll be interested on this defense in depth  
22 capabilities. Thank you.

23 MEMBER BLEY: This is Dennis Bley. Will  
24 you include ATWS events in this new -- do you propose  
25 any action to compensate for the fail to screen? I'm

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1 just wondering how you can have seven days if you  
2 don't have a tip. And I can't hear anything anybody's  
3 saying.

4 MR. WATKINS: David, do you have a  
5 response to that?

6 MR. HINES: The seven-day capacity  
7 discussed here is for a station blackout-type event  
8 that is purely based upon heat removal of a shutdown  
9 reactor. I'm not sure if that answered your question  
10 or not.

11 MEMBER BLEY: Well, your bullets leave me  
12 wondering. It says it takes care of an ATWS as well  
13 as a station blackout. Is that --

14 MEMBER MARCH-LEUBA: Dennis, this is Jose.  
15 Maybe we can have this discussion during the closed  
16 session, because that -- we talked about that during  
17 the Subcommittee.

18 MEMBER BLEY: Fair enough.

19 MEMBER MARCH-LEUBA: Yeah, so let's take  
20 a note to talk about the actions discussed here once  
21 we're in the closed session.

22 MR. WATKINS: Okay.

23 MEMBER MARCH-LEUBA: Please continue.

24 MR. WATKINS: Okay, thank you. Any other  
25 questions on ICS before I move forward?

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1           Okay, on Slide 14, this provides the  
2 overview of the BWRX-300 RPV isolation concept. As we  
3 discussed earlier, this includes the use of RPV  
4 isolation valves and other design features. The RPV  
5 isolation valves include two valves in series, each  
6 independently able to isolate the line. The automatic  
7 isolation function is single failure proof. And the  
8 valve bodies will meet the requirements of ASME Boiler  
9 & Pressure Vessel Code Section III, Class I.

10           The design objectives of the BWRX-300  
11 reactor pressure boundary is to minimize the impact of  
12 the LOCAs by minimizing the number of nozzles --  
13 (Telephonic interference.) -- and 9-mil pipe diameters  
14 inside containment, maximizing the elevation of the  
15 nozzles above top of active fuel, and eliminating some  
16 specific design features previously used in BWRs in  
17 response to LOCAs that also contributed to the -- with  
18 LOCAs occurring.

19           Any questions on Slide 14?

20           MEMBER MARCH-LEUBA: No, go ahead.

21           MR. WATKINS: All right. On Slide 15, we  
22 describe the design requirements for the reactor  
23 pressure vessel and the reactor pressure vessel  
24 nozzles. They will be designed using current versions  
25 of codes and standards, using similar selection the

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1 design code is -- (Telephonic interference.) -- as was  
2 used for the ESBWR.

3 Piping and valves connected to the nozzles  
4 shall be designed to not exceed allowable loads. The  
5 feedwater inlet nozzles and the isolation condenser  
6 condensate return nozzles are designed to account for  
7 stresses caused by cooler ejection water. The nozzle  
8 shall be low alloy, still 4Gs, except for the water  
9 level instrumentation nozzles.

10 And the design of all the nozzles shall be  
11 in accordance with ASME Section III, Subsection ND and  
12 meet absolute requirements of the reactor pressure  
13 design documents.

14 Flange connections that are part of the  
15 RPV assembly are to be designed to ASHME Boiler &  
16 pressure Vessel Code Section III, Subsection ND,  
17 requirements, that are the current versions at the  
18 time of procurement.

19 MEMBER MARCH-LEUBA: David, it's Jose. If  
20 it's not proprietary, although we will have a closed  
21 session, have you guys decided on water level  
22 instrumentation technology? The fact you say flange  
23 gives me a idea of what you want to use, but can you  
24 talk about that? What the water level percentages  
25 will be.

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1 MR. WATKINS: Yeah, David, can you talk  
2 about water level instrumentation?

3 MR. HINES: For the safety-related  
4 actuations, water level instrumentation is currently  
5 planned to be by use of what we've been using on our  
6 current operating fleet, meaning differential pressure  
7 sensing technology. That's for actuation, safety-  
8 related actuations, and for normal control of water  
9 level.

10 We are still working on a severe accident-  
11 type of water level indication for a fuel zone  
12 indication, so I'm not prepared to answer the fuel  
13 zone indication, and some of it may be proprietary as  
14 well. But for normal actuation differential pressure  
15 sensors, since we have a active supply chain for  
16 safety-class instrumentation. And that is where our  
17 safety-class instrumentation for water level is.

18 MEMBER RICCARDELLA: Excuse me, this is  
19 Pete Riccardella. Are there any -- the last bullet  
20 talks about flange connections. Are there any flange  
21 connections, other than the main reactor vessel head?

22 MR. HINES: This is David Hines again.  
23 Oh, sorry, George. Go ahead.

24 MR. WATKINS: Okay, so they're normally on  
25 our BWRX-300, as well as the operating fleet, we use

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1 flange connections for the fine motion controller  
2 drives in the RPV head. And then additionally on the  
3 ABWR, we have flange connections for the reactor  
4 internal pump. So we have a experienced connections  
5 to RPV.

6 MEMBER RICCARDELLA: Okay, so it's the  
7 control rod drive mechanisms plus the head, basically.

8 MR. HINES: Yes, that's correct.

9 MEMBER RICCARDELLA: All right, thank you.

10 MR. WATKINS: Any other questions on Slide  
11 15? Okay, Slide 16 describes the design requirements  
12 for the RPV isolation valves and the valve actuators.  
13 I'm not going to really read all of these off. The  
14 specific design requirements are there to ensure that  
15 the isolation valves have the required single failure  
16 criteria being met and have low leakage potential.

17 They are a fail-close RPV isolation valve  
18 that automatically close on high containment pressure  
19 indicating a LOCA. There are also some valves,  
20 basically the one for the ICS, which fail as-is.  
21 Since we need the ICS to be available during loss of  
22 coolant accidents, we will discuss a little bit later  
23 a little bit more about ICS.

24 Are there any questions on Slide 16?

25 MEMBER BALLINGER: Yeah, this is Ron

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1 Ballinger. With respect to the isolation valves, this  
2 may be proprietary, I guess, but we can wait, but will  
3 they have to be verified as being leak-tight prior to  
4 operation after refueling?

5 MR. WATKINS: Yes, they will have leakage  
6 requirements specified, probably in the technical  
7 specifications for the operating license for the plant  
8 to verify their leakages within the analysis  
9 assumptions.

10 MEMBER BALLINGER: So and that -- this  
11 analysis or testing would be done at the plant?

12 MR. WATKINS: There would be the need for  
13 plant testing, yes. But they would probably be, well,  
14 I know there would be procurement specification  
15 required testing by the vendors to make sure that they  
16 do exhibit low leakage potential from the factory.

17 MEMBER BALLINGER: Thank you.

18 MR. WATKINS: Any questions on Slide 16?  
19 Okay, Slide 17 describes the design and analysis  
20 requirements for the large pipe breaks, which are  
21 typically medium or large LOCAs.

22 They will be isolated within a time frame  
23 which limits peak pressure and containment and ensures  
24 that all the SSCs required, the structure systems and  
25 components, required to mitigate the LOCA will be

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1 operable in the environmental conditions that exist  
2 inside the primary containment vessel.

3 Reactor protection systems performs  
4 control of reactivity function by shutting down the  
5 core. And the other structures, systems, and  
6 components that comprise the emergency system and  
7 passive containment cooling system perform fuel  
8 cooling and long-term heat removal functions. The  
9 logic for the BWRX-300 is to preserve core coolant and  
10 to remove decay heat in the long term.

11 As we stated earlier, the acceptance  
12 criteria that the SSC's comprising are emergency core  
13 cooling system, maintain reactor level at or above top  
14 of active fuel, or fuel cladding temperature within  
15 normal operating temperature.

16 VICE CHAIR REMPE: Excuse me, this is Joy,  
17 could I ask a question here?

18 MR. WATKINS: Yes.

19 VICE CHAIR REMPE: I know earlier you said  
20 you do have DP cells that are for safety-related  
21 actuations. But you're in this fuel zone, you are  
22 still working on something. So this last bullet begs  
23 the question, how much above the water level is for  
24 these safety-related actuations, and is there going to  
25 be some sort of analysis done to give confidence? Are

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1 you going to rely on this yet-to-be-determined sensor  
2 in the fuel zone to give confidence in this bullet?

3 MR. WATKINS: Yes, as far as, basically,  
4 analysis, the safety analysis of course will determine  
5 a calculated value, you know, as we run our trap G  
6 codes. But you know, in fact the instrumentation set  
7 points are all based on set point methodology, which  
8 allows for instrument errors, instrument drift,  
9 calibration errors, those types of things, to make  
10 sure that the actuation set points will reliably  
11 isolate the reactor using the RPV isolation valves at  
12 the appropriate time frame to make sure we can meet  
13 this acceptance criteria.

14 As far as monitoring within the core, I  
15 don't believe we will -- I'll let David Hines answer  
16 that as far as, you know, what we did and didn't look  
17 at during a event to determine what has happened with  
18 the core water level.

19 MR. HINES: Yes, as you stated, this  
20 discussion is displaying analytical results, which we  
21 have the capability of analyzing and determining the  
22 predicted response for a given postulated pipe break.

23 The discussion on the instruments is, we  
24 a do few years' uncertainty calculations and drift and  
25 had a whole set point methodology for the instruments,

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1 such that I'll, and you know, uncertainty and drift is  
2 all taken into account in our set point, set points  
3 for the actuations, to ensure the actuations occur  
4 with margin.

5 And the discussion about fuel zone  
6 monitoring is for, only for operator indication, no  
7 actuations are planned for that instrumentation. All  
8 actuation instrumentation is that that I just  
9 discussed previously with differential.

10 VICE CHAIR REMPE: Thank you.

11 MR. HINES: So actuations of safety  
12 systems should have already occurred, is my point.

13 MEMBER MARCH-LEUBA: Can I -- this is Jose  
14 again, for the safety system you plan to use, the  
15 entire instrumentation that is working now on the  
16 reactors, on the film, and you are developing or  
17 thinking of developing a more advanced, or maybe a  
18 different technology, which is not defined yet, for  
19 monitoring of severe accidents in the fuel zone. Is  
20 that correct?

21 MR. HINES: Yes, that's correct. And  
22 again, that's -- ladder one is only for operator  
23 indication, no actuations, that is correct.

24 MEMBER MARCH-LEUBA: Thank you.

25 MEMBER RICCARDELLA: Pete Riccardella

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1 again, a couple of questions. What's the nature of  
2 the containment? Is it a pressure suppression  
3 containment with a suppression pool?

4 MR. WATKINS: No, the -- this is George  
5 Watkins again. The BWRX-300 containment is a  
6 significantly large drive for the size of the vessel.

7 MEMBER RICCARDELLA: Okay. And then  
8 secondly, is there a -- you talk about these  
9 isolations valves. Is there a segment of piping  
10 between the most inboard isolation valve and the  
11 vessel that could possibly fail and not be isolated?

12 MR. WATKINS: We would need to discuss  
13 that in the closed session.

14 MEMBER RICCARDELLA: Okay, all right,  
15 thank you.

16 MEMBER MARCH-LEUBA: I'm making a note of  
17 that, I already have valves for closed session.  
18 Continue.

19 MR. WATKINS: Okay, any other questions on  
20 Slide 17?

21 MEMBER PETTI: So I have a question, and  
22 it may move to the proprietary session. It's just  
23 simple, or high level, how does this differ from ESBWR  
24 in the accident analysis space in terms of what  
25 dominates now? Because it seems like you've taken a

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1 lot of the events out of this design, so what pops to  
2 the top?

3 MR. WATKINS: Yeah, we've eliminated  
4 several of the initiating -- or the initiating events  
5 in the PRA from the SBWR that relate to the fact that  
6 they were used in a suppression pool concept with a  
7 blowdown of the reactor after an accident. Whereas we  
8 use a preservation of inventory and cooling with the  
9 ICS.

10 So we can go into more detail in the  
11 closed session, but that's basically the difference or  
12 the systems, the whole concepts of how LOCAs are  
13 mitigated in this design as eliminated components,  
14 which were fairly large initiating indicators in the  
15 PRA. So I think we can discuss that a little further  
16 in the proprietary session.

17 MEMBER PETTI: Okay, thank you.

18 MR. WATKINS: Any other questions from  
19 Slide 17?

20 MEMBER RICCARDELLA: You mentioned the  
21 main -- the largest steam line break, this main steam  
22 line. What's the diameter of the main steam line, can  
23 you mention that?

24 MR. WATKINS: David, can you tell me what  
25 the most recent diameter is?

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1 MR. HINES: It's approximately 20-inch.

2 MEMBER RICCARDELLA: Twenty inch, okay.

3 MR. HINES: Nominal.

4 MEMBER RICCARDELLA: Thank you.

5 MR. WATKINS: Any other questions?

6 Okay, Slide 18 describes the design  
7 analysis requirements for our small pipe breaks, the  
8 small LOCAs. These are breaks that are smaller than  
9 the ones that are mitigated by the RPV isolation  
10 valve, mitigated by the placements of the nozzles on  
11 the vessel compared to the tops of active fuel.

12 And again, relies on the same ECCS and  
13 PCPS systems to perform fuel cooling and long-term  
14 heat removal functions. Our sensitivity analysis has  
15 demonstrated that we can apply the acceptance criteria  
16 of reactor water level at or above top of active fuel,  
17 or fuel cladding temperature within normal operating  
18 temperature.

19 Below the size of a small break, which do  
20 not exceed the capability of our high pressure control  
21 rod drive system, those can also be mitigated by these  
22 same ECCS and PCPS system. But typically these types  
23 of small leaks are not an issue because of the CRD  
24 makeup and the fact that you have extremely high feed-  
25 water flow through the reactor during that type of a

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1 small leak.

2 So typically your normal operating control  
3 systems would prevent this from being an issue, and  
4 the operators would simply shut the plant down in a  
5 controlled manner in accordance with their technical  
6 specifications for RCS leakage above the required  
7 limits.

8 MEMBER MARCH-LEUBA: This is Jose again.  
9 I don't see any problem with what you're saying, but  
10 certainly when we do the final review when you have  
11 the T's crossed and the I's dotted, we would like to  
12 understand the technique -- or, classification of the  
13 SSCs. For example, the CRD, if you take away from it,  
14 does it need to be safety or not. This is a type of  
15 discussion we're having all the time. So just  
16 anticipate that we'll be asking you those questions.

17 MR. WATKINS: Yes, I understand. All  
18 right, any other questions?

19 MEMBER MARCH-LEUBA: We just lost -- we  
20 lost the slides, or at least I did.

21 MR. WATKINS: Okay, hold on a second here.

22 MEMBER BLEY: Me too.

23 MEMBER RICCARDELLA: I lost the slides --  
24 slides, sound, and everything. Is -- are we still on,  
25 are we still connected?

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1 MEMBER MARCH-LEUBA: We are. GE is trying  
2 to recover the slides.

3 MEMBER RICCARDELLA: Okay, thank you.

4 MEMBER MARCH-LEUBA: The problem with  
5 having so many Skype-like programs, each one is used  
6 to different ones, so you need to find the right  
7 buttons.

8 MEMBER BLEY: But again, this used to go  
9 into Teams.

10 MEMBER MARCH-LEUBA: David, are you still  
11 on?

12 MR. HINES: I'm on, George is on here.  
13 Can you see my slides now?

14 MEMBER MARCH-LEUBA: No.

15 MR. HINES: Okay, I got to --

16 VICE CHAIR REMPE: But we do have copies  
17 of them, and if you'll just tell us what slide you're  
18 on, I think it's fine. What do you think, Jose?

19 MEMBER MARCH-LEUBA: I'm happy with that.  
20 Oh -- they're loading now.

21 MR. WATKINS: It's loading now, right?

22 MEMBER MARCH-LEUBA: Okay, so you can  
23 start talking now. We were on Slide 18?

24 MR. WATKINS: Yes, Slide 18. This is one  
25 we were talking, just talking about. And Jose, you

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1 had made the comments about, seeing the final  
2 classification of the SSCs that we use for these  
3 events.

4 MEMBER MARCH-LEUBA: That's something  
5 we'll be very interested in.

6 MEMBER KIRCHNER: Jose, may I ask a  
7 question? This is Walt.

8 George or David, your containment  
9 nominally would be a dry containment? So you would  
10 have a tech spec on leakage detection? And I guess  
11 the trip for this would be just the pressure in the  
12 containment? Or maybe that's a question for the  
13 closed session.

14 MR. WATKINS: Yeah, I think we can talk  
15 about this typical actuation signals for determining  
16 whether you have a LOCA event or not in the closed  
17 session.

18 MEMBER KIRCHNER: Okay, thank you. Yeah,  
19 it's just that you got the heart of my question,  
20 differentiating between leakage and LOCA.

21 MR. WATKINS: Right. Okay, any other  
22 questions on Slide 18?

23 MEMBER MARCH-LEUBA: Yes. I'm sorry we're  
24 a little bit behind on time, but we're moving a lot of  
25 stuff to the closed session and we didn't have that

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1 much time and we don't have that much time allocated  
2 there. So chop, chop, let's start moving.

3 MR. WATKINS: Yeah, I'll keep going. I'll  
4 keep going as quick as I can. So Slide 19, the  
5 details are LOCA-excessive criteria. We already  
6 discussed this, that we have a surrogate to BWRX-300,  
7 acceptance criteria. It bounds the acceptance  
8 criteria at 50.46(b) in meeting all the requirements  
9 of 50.46(b), as we state on this slide.

10 Any questions on Slide 19?

11 MEMBER MARCH-LEUBA: No.

12 MR. WATKINS: Okay. Slide 21 provides an  
13 overview of the BWRX-300 overpressure protection  
14 concept. Our overpressure protection concept utilizes  
15 the safety-related reactor protection system, which  
16 assists in overpressure protection by initiating  
17 reactor scram.

18 And we have these dedicated isolation  
19 condenser system, which assists in overpressure  
20 protection by removing decay heat passively with  
21 minimal loss of reactor coolant.

22 The overpressure protection requirements  
23 for the reactor coolant pressure boundary comply with  
24 the ASME Boiler & Pressure Vessel Code Section III,  
25 Article MD 7000 requirements. So we will hear more

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1 about that in the closed session.

2 Any questions on Slide 21?

3 Okay, I'll quickly go through the Slides  
4 23-26. We will hear more from the NRC staff on their  
5 review.

6 But the LTR does describe how the design  
7 complies with the various 10 C.F.R. 50 regulatory  
8 requirements, including 50.34(f), Three Mile Island-  
9 related requirements; 50.46, acceptance criteria for  
10 ECCS systems; and on Slide 24, 10 C.F.R. 50.55(a) for  
11 codes and standards applied to the mechanical design  
12 features of the reactor pressure vessel isolation; and  
13 compliance with the 10 C.F.R. 50 Appendix A, general  
14 design criteria.

15 We also have in the LTR descriptions of  
16 our -- of applicable regulatory guidance and the way  
17 the design and requirements acceptance criteria  
18 conform to those guidelines, which includes the  
19 regulatory guides, which are shown on this page, Alide  
20 25. And on Slide 26, the standard review plan  
21 applicable sections, and the other generic  
22 requirements of NUREG-0715 action plan, and the two  
23 different generic letters that are shown here on the  
24 slide, Generic Letter 8302 and Generic Letter 9507.

25 Are there any additional questions at this

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1 time on regulatory evaluation?

2 MEMBER MARCH-LEUBA: Yes. I assume that  
3 when you complete the design, you will ask for  
4 exceptions for some rules that don't apply, like post-  
5 TMIs, things like that. But do you now anticipate any  
6 exception on the general design criteria? Or will you  
7 be using the --

8 MR. WATKINS: Yeah, we do not have any  
9 intentions, I believe, necessary to the GDC, general  
10 design criteria, shown on Slide 24 for this LTR.

11 MEMBER MARCH-LEUBA: That's good, that's  
12 good to hear. Thank you.

13 MR. WATKINS: Okay. So I'll turn it back  
14 over to Michelle for some closing remarks, and then  
15 she can turn that over to the NRC staff for their  
16 presentation.

17 MS. CATTS: Okay, thanks, George and  
18 thanks David. So I do want to again thank the ACRS  
19 for their time to discuss the first BWRX-300 LTR on  
20 reactor pressure vessel isolation and overpressure  
21 detection. And as I said earlier, the ACRS really  
22 does play a key part in these approvals, so we thank  
23 you for your questions and your participation and your  
24 time.

25 MEMBER MARCH-LEUBA: Thanks for that.

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1 Michelle, I just wanted to say this is the first  
2 topical report and introduction to the design. But we  
3 also had, since our moving, we have new, two  
4 additional topical reports scheduled for review in  
5 this fall. And we look forward to interacting with  
6 the GE on everything. Thank you.

7 Any questions from the members for GE? If  
8 not, we can transition to the open session from the  
9 staff. Mike Dudek will lead.

10 MR. DUDEK: Okay, I'm prepared. Rani, can  
11 you put up the slide deck?

12 MEMBER MARCH-LEUBA: The slides are  
13 loading, you can start.

14 MR. DUDEK: All right.

15 MEMBER MARCH-LEUBA: Always takes a  
16 minute, there it goes.

17 MR. DUDEK: Well, thank you. Appreciate  
18 GEH giving such and in-depth presentation. As I said  
19 in my opening remarks, we have tried to meet the  
20 expectation of the Committee and present a little bit  
21 more information into the public sector. And now I'll  
22 turn it over to the staff.

23 Rani, next slide please. And really, in  
24 licensing BWRX-300 in these topical reports, we've  
25 done in-depth pre-application discussions with GEH.

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1 GEH, in accordance with those discussions, plans to  
2 submit several topical reports. They have three in-  
3 house now, from containment systems to this  
4 overpressure protection to reactivity, and also  
5 containment performance.

6 So the three in-house right now, they have  
7 a fourth on the way that will be submitted either  
8 early next month or late next month. So that is  
9 what's on the horizon. We will be bringing you each  
10 of these topical reports in the near term, however, we  
11 are working with Zena to get applicable dates for the  
12 containment performance and the reactivity control  
13 SERs, as they're going through NRC management review  
14 right now.

15 And as you can see, that last bullet on  
16 the slide, GE plans to submit other LTRs on  
17 construction methodology, severe accident management,  
18 source term methodology, and containment evaluation  
19 method. So with that slide, next slide.

20 MEMBER KIRCHNER: Mike, this is Walt  
21 Kirchner. May I interrupt a little? It looks like,  
22 just based on the slides, that you've got containment  
23 evaluation methodology coming up later, and  
24 containment performance already being reviewed. How  
25 do those square?

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1 MR. DUDEK: So I'll rely on either Becky  
2 or Tom for that explanation.

3 MS. PATTON: Yeah, so this Becky Patton.  
4 The containment performance topical that's already in  
5 house is basically similar to this one that you're  
6 reviewing, where it steps through the regulations and  
7 the acceptance criteria.

8 The -- and it specifies, if I recall  
9 right, like, what method will be used. But then the  
10 details of that method come in the later topical  
11 report. So the one that's under review is really more  
12 the framework, and then the one that's yet to be  
13 submitted will actually provide the methodology.

14 MEMBER KIRCHNER: Okay, and then the  
15 actual containment -- I'm forgetting the acronym that  
16 you use for containment evaluation, that will come  
17 later then?

18 MS. PATTON: That's correct. The actual  
19 methodology is that upcoming one.

20 MEMBER KIRCHNER: Okay.

21 MS. PATTON: That Mike mentioned that  
22 hasn't been submitted yet.

23 MEMBER KIRCHNER: All right, thank you.

24 MR. DUDEK: Any other questions on GEH's  
25 proposed topical report schedule?

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1 MEMBER MARCH-LEUBA: Yes, this is Jose.  
2 So the evaluation methodology and the criteria, what  
3 we call containment performance, will be settled  
4 before we have to review the actual -- how does the  
5 actual containment work when we see the final safety  
6 analysis report. So when Chapter 15 analysis evaluate  
7 the containment, they will use methodology that will  
8 be approved. Is that correct?

9 MR. DUDEK: That is correct.

10 MEMBER MARCH-LEUBA: Okay, thank you.

11 MEMBER KIRCHNER: Also it would be Chapter  
12 6 to demonstrate that it's within the code limits, et  
13 cetera.

14 MR. DUDEK: Yes, so GEH is taking specific  
15 chunks, whether it's the methodology or specific  
16 aspects of that containment performance, and getting  
17 it to us early before their main application to help  
18 speed up the review and help get some regulatory  
19 assurance on the docket. So that's kind of the  
20 methodology and the thinking behind these topical  
21 reports.

22 And as always, thanks to the diligent NRC  
23 staff review team. For the mechanical engineering and  
24 in-service testing, you know, really Tom Scarbrough,  
25 Renee Li, and Jason Huang are the, doing the bulk of

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1 the review. And under the Nuclear Methods Systems and  
2 Nuclear Reactors Branch, Becky Patton's branch, it's  
3 Andrew Proffitt and Ryan Nolan.

4 And as always, thanks to my diligent PM,  
5 Rani Franovich, who's working the slide deck today,  
6 and who processes diligently all these requests in  
7 accordance with George Wonder, who is also helping  
8 out.

9 So Tom, without any further ado, I think  
10 I'll turn it over to you for the technical discussion.

11 MR. SCARBROUGH: Okay, thank you, Mike.  
12 This is Tom Scarbrough, I'm in the Mechanical  
13 Engineering and In-Service Testing Branch.

14 The BWRX-300 is a small modular reactor  
15 that used natural circulation for reactor coolant  
16 flow. If a plant event occurs, this SMR relies on  
17 passive cooling of the reactor core using an isolation  
18 condenser system, ICS.

19 Topical report NEVC-33910 specifies the  
20 design requirements related to the isolation and  
21 overpressure protection of the reactor pressure vessel  
22 for the BWRX-300 design. We'll discuss some of the  
23 details of the various features in the closed session.  
24 Next slide please.

25 So the detail design of the BWRX-300 SMR

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1 is not complete. Therefore, the NRC staff reviewed  
2 the intent of the BWRX-300 design to satisfy the  
3 applicable NRC regulatory requirements and regulatory  
4 guidance documents related to the reactor pressure  
5 vessel isolation and overpressure protection.

6 This slide lists some of the NRC  
7 regulations and regulatory guidance documents  
8 applicable to the staff review for the RPV isolation  
9 overpressure protection.

10 For example, the NRC staff reviewed the  
11 topical report regarding the intent of the RPV  
12 isolation overpressure protection features to satisfy  
13 10 C.F.R. 50.34, which specifies the Three Mile Island  
14 accident requirements; 10 C.F.R. 50.46, which  
15 specifies the emergency core cooling system acceptance  
16 criteria; 10 C.F.R. 50.55(a), which incorporates by  
17 reference the ASME Boiler & Pressure Vessel Code and  
18 the ASME Operation & Maintenance Code; and 10 C.F.R.  
19 Part 50, Appendix A, which specifies general design  
20 criteria for nuclear power plants.

21 The staff also reviewed a topical report  
22 regarding the intent to satisfy several NRC regulatory  
23 guides, such as Reg Guide 1.26 for quality group  
24 classifications, Reg Guide 1.29 for seismic design  
25 classification, Reg Guide 1.45 for monitoring reactor

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1 coolant system leakage, and Reg Guide 1.84 for ASME  
2 Boiler & Pressure Vessel Code Section III design code  
3 cases.

4 The staff also reviewed the topical report  
5 regarding the intent to satisfy applicable sections of  
6 the NRC standard review plan, such as Section 5.2.2,  
7 which relates to overpressure protection; Section  
8 5.4.13, with respect to isolation condenser systems  
9 and boiling water reactors; Section 6.3, with respect  
10 to emergency core cooling system; and Section 15.6.5,  
11 regarding loss of cooling accidents from postulated  
12 pipe breaks.

13 Mike Dudek will now discuss the  
14 conclusions.

15 MEMBER MARCH-LEUBA: Tom, I have a  
16 question on the previous slide. One concern we have  
17 when we review -- see, ACRS is supposed to review  
18 these things at a high level, at 40,000 feet, so one  
19 question we have is the SRP is an excellent, and  
20 NUREG-0800 is an excellent document. It helps a lot  
21 because it's the crowd sourcing of a lot of people  
22 working on operating reactors for the last 50 years,  
23 and it covers everything.

24 When you have a new reactor, there might  
25 be accidents that are not covered by the SRP. And

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1 have you given any thought -- we call this sometimes  
2 in our discussion a blank piece of paper. Start from  
3 the beginning and make sure that you didn't miss an  
4 event that is not SRP-driven. So --

5 MR. SCARBROUGH: Well, yes, thank you for  
6 the question, because just like we did with NuScale,  
7 the staff uses the SRP as guidance for its review,  
8 because it's a lot of history there in terms of how we  
9 looked at it. But then when we have a new design, the  
10 staff uses its engineering judgement to look for  
11 there's anything that might not be addressed directly  
12 in the standard review plan. So, and we've had quite  
13 a few discussions about that regarding NuScale.

14 So yes, I am confident that the staff,  
15 when we go through and review the actual submittal for  
16 the BWRX-300, the staff will look and follow the SRP  
17 guidance, but then use their own judgment to see if  
18 there's anything that needs to be reviewed that's,  
19 that may not have been addressed in the SRP because of  
20 the new design features of this reactor.

21 MEMBER MARCH-LEUBA: That is excellent and  
22 we'll be looking forward to reviewing what comes out.

23 It would be nice, since we are in the beginning of  
24 the process, if this process that you said, looking  
25 outside SRP is documented somewhere. At least have a

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1 document that says the following group of experts met  
2 here and there and they proposed this accidents, or  
3 didn't propose this accident. So have some  
4 documentation about it, because when you become a  
5 little formalized, it makes you think better.

6 MR. SCARBROUGH: That's a really good  
7 suggestion. I'll take that back and see if we could  
8 have a group of the various technical subject-matter  
9 experts review, you know, when the design comes in for  
10 review, to look at the various aspects to see if there  
11 might be something that we need to look at that might  
12 not have been covered specifically in the SRP. So  
13 thank you.

14 MEMBER MARCH-LEUBA: And again, this is  
15 us, individual members' comments, but I would make it  
16 a living document so as the design -- the design  
17 review progresses, some guy did a review in Chapter 6  
18 sees something or thinks of something that Chapter 7  
19 should be looking at. And that kind of living  
20 document could allow for those interactions and  
21 capture the concerns of Chapter 6 applied to Chapter  
22 7, which are difficult to capture. I don't know,  
23 think about it.

24 MR. SCARBROUGH: Yes, sir, thank you. I,  
25 and I, based on our experience with NuScale, I mean,

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1 we've had -- we had tremendous interaction among the  
2 various technical staff members, regardless of which  
3 chapter they officially were assigned. I worked with  
4 a lot of people in different, you know, branches who  
5 worked on different sections, different chapter.

6 And there was quite a bit of cooperation  
7 and interaction among the -- among the branches. So  
8 yeah, that's a really good suggestion. I'll take that  
9 back and see if we can make that more formal. Thank  
10 you.

11 MEMBER MARCH-LEUBA: Don't spent too many  
12 years, okay. It's just make it a little formal so it  
13 --

14 MR. DUDEK: So Jose, two comments in  
15 accordance with what you just suggested. A very good  
16 comment and we will, as you know we are doing a nuts-  
17 to-bolts lessons learned review on NuScale, so we will  
18 definitely add that comment to our list of comments  
19 and concerns.

20 Also, you are aware secondly that there  
21 was a site-specific review plan that did tease out a  
22 lot of those concerns and individual and site-specific  
23 or design-specific requirements for NuScale. And I  
24 thought that's kind of where we did do that deviation  
25 from the standard review plan and really tried to do

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1 a design-specific review.

2 MEMBER MARCH-LEUBA: Yeah, I think we're  
3 trying to do the best we can and we are trying to do  
4 the right thing. In my opinion, I always say that the  
5 student always studies best the night before the exam.  
6 So if you have a formal way to document it, it forces  
7 you to think more.

8 But the other point is if we can make a  
9 living document. Because the way my brain thinks, we  
10 have this meeting and everything is okay, and next  
11 week on Wednesday, I'll be in the shower and suddenly  
12 say, ah, what about this. The brain, at least my  
13 brain, works on delay mode. So just because you have  
14 meeting in December 2020, while you're doing the  
15 review, you might trigger some thoughts that need to  
16 be added. So that's just a suggestion.

17 MR. DUDEK: No, that's a good suggestion  
18 and we'll add it to the lessons learned and we'll  
19 certainly evaluate it and try to put some more meat  
20 behind that. So we'll definitely evaluate it, your  
21 comment.

22 As for the conclusion, you know, as Tom  
23 alluded to, that the NRC concludes that GEH in this  
24 LTR provides an acceptable description of the design  
25 requirements acceptance criteria and regulatory basis.

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1 And for this particular LTR and the overpressure  
2 protection, the staff did complete their review and  
3 their SER.

4           However, you know, that being said, this  
5 is only for one piece, and the detailed design review  
6 for the overall SMR has not been completed or even  
7 initiated, for that matter. It all depends on, you  
8 know, how we pace through these topical reports and  
9 how, if, and when the design is merited up with a  
10 site, on whether GEH submits under Part 50 or Part 52  
11 for a design. I think that's yet premature to  
12 speculate on how that's going to occur.

13           But regardless, for this particular piece,  
14 we have evaluated regulatory compliance and we think  
15 it's, it meets and it's acceptable. So with that  
16 being said, I think we can move into the closed  
17 session to provide a little bit more details about how  
18 and what the staff evaluated and how we evaluated some  
19 of that proprietary information while providing this  
20 first LTR.

21           MEMBER MARCH-LEUBA: Thanks, Mike. And I  
22 wanted to emphasize both you and GEH, thank you for  
23 having moved most of the information to the open  
24 session, because the public has a right to know. And  
25 I think this was -- it took a little work on your

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1 part, but it was a profitable exercise. And I thank  
2 you both.

3 So Members, any questions for the staff?  
4 Or GE, the opposition?

5 MEMBER KIRCHNER: I just, this is Walt,  
6 Jose, it's not a question, just a statement. I just  
7 want to add onto your statement. Thank you to both  
8 the staff and GE for moving much of the material into  
9 the open environment. I think that helped immensely.  
10 Thank you.

11 MEMBER MARCH-LEUBA: Can we go start  
12 opening the public line on the phone, to ask comments  
13 from public?

14 MR. DASHIELL: The public line is open for  
15 comments.

16 MEMBER MARCH-LEUBA: Okay, at this point,  
17 any member of the public, anybody, do they have a  
18 comment? If so, please state your name and provide  
19 the comment.

20 We'll wait a little because it takes time  
21 to unmute yourself.

22 But I will say there's no comments. So we  
23 are going to temporarily close this open session,  
24 which will continue in the afternoon, the same phone  
25 number. And GEH, the staff, and ACRS, we're going to

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1 move to the closed session phone number, just look for  
2 the invitation in Skype.

3 Matt, when do you want to resume? You  
4 want to have a ten-minute break to, for everybody to  
5 get into the closed session?

6 MEMBER SUNSERI: So yes, Jose, let's do a  
7 ten-minute break while we transition. But I want to  
8 also say though that, for the public listening in, I  
9 anticipate that we will return briefly to open session  
10 around 1:25, of which we'll just sum up anything that  
11 we can from the closed session.

12 And then we will enter our lunch break at  
13 1:30. And then we will pick up with the next topic,  
14 which is the former space agreement element topical  
15 report at 2:30 p.m., just to give everybody a heads up  
16 on where we're going.

17 So yes, as we transition now, we will  
18 resume the closed session at 25 to the hour on the  
19 line that you mentioned, so.

20 MEMBER MARCH-LEUBA: Okay, see you all  
21 there.

22 (Whereupon, the above-entitled matter went  
23 off the record at 12:25 p.m. and resumed at 2:30 p.m.)

24 CHAIR SUNSERI: So good afternoon, it's  
25 2:30, time to resume our session. My name is Matt

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1 Sunseri, and I'm going to begin with the roll call of  
2 the members. Ron Ballinger?

3 MEMBER BALLINGER: Here.

4 CHAIR SUNSERI: Dennis Bley?

5 MEMBER BLEY: Here.

6 CHAIR SUNSERI: Charles Brown?

7 MEMBER BROWN: Here.

8 CHAIR SUNSERI: Walt Kirchner?

9 MEMBER KIRCHNER: Here.

10 CHAIR SUNSERI: Dave Petti?

11 MEMBER PETTI: Here.

12 CHAIR SUNSERI: Joy Rempe?

13 VICE CHAIR REMPE: Here.

14 CHAIR SUNSERI: Pete Riccardella?

15 MEMBER RICCARDELLA: I'm here.

16 CHAIR SUNSERI: Okay. We have everyone  
17 present that is supposed to be here, we have a couple  
18 of members out for official reasons and we do have a  
19 quorum.

20 So just before we get into the topic of  
21 this hour, I just want to close the loop on our last  
22 session. We did go into closed session and discuss  
23 proprietary information regarding the BWRX-300 Reactor  
24 Vessel and Overpressure Protection System.

25 We will be preparing a letter report on

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1 that topic, and the GEH folks are reviewing the  
2 material that we are putting together and propose for  
3 that letter report right now.

4 As soon as we get a go-ahead from them  
5 that there's no proprietary information in that letter  
6 or whatever might be there can be redacted, then it is  
7 our plan to bring that letter forward into a public  
8 session, edit it, and produce it in the public  
9 session.

10 So as soon as we get that report back from  
11 GEH on that, then we will know which direction we're  
12 going on that. So members, any questions on that  
13 topic?

14 MEMBER PETTI: Matt, we'll start with  
15 taking comments from the Committee, like we usually  
16 would, after the read-through?

17 CHAIR SUNSERI: Yes, yes, yes, we'll --

18 MEMBER PETTI: Yes, yes, yes, okay.

19 CHAIR SUNSERI: We'll go to our normal  
20 process, yes. Thanks --

21 MEMBER PETTI: Okay.

22 CHAIR SUNSERI: -- thanks, Dave.

23 MEMBER PETTI: Thanks.

24 CHAIR SUNSERI: Yes. Okay. So thank you.

25 Any more? All right, good.

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1           So now, we are ready to begin the next  
2           topic, which is Topical Report ANP-10337, Supplement  
3           1, Deformer Spacer Grid Element. This session will  
4           also be an open/closed session, and the closed part  
5           will be to deal with the proprietary information.

6           At this time, I will turn to Member  
7           Ballinger, who's our lead member for this topic, for  
8           introductions and the presentation of material. Ron?

9           MEMBER BALLINGER: Thank you, Mr. Chairman.  
10          This meet -- we had an earlier subcommittee meeting on  
11          this topic, which is this report ANP-10337, Supplement  
12          1, Revision 0, on Deformer Spacer Grid Element, which  
13          is an augmentation to the ANP-10337 original document.  
14          We had that meeting on July 7. And so we'll hear from  
15          Framatome and the NRC today on this topic, and we  
16          anticipate a letter later on.

17          A few I guess housekeeping issues. Scott  
18          Krepel will be a presenter for the NRC. And we have  
19          to be sure that his interpreters, Jennifer Wagner and  
20          Lisette Madalena, are allowed into the system when we  
21          get to the closed session.

22          Chris Brown will pull the letter up when,  
23          the draft letter, when it's necessary, as well as the  
24          slides.

25          Derek Widmayer will be sending out an

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1 invitation for the closed session, which I suspect  
2 will begin quite quickly, because most of the  
3 presentation will be probably proprietary.

4 So I think that covers it. And I think  
5 Joe Donoghue from NRR, are you there?

6 MR. DONOGHUE: Yes, I am, Member Ballinger,  
7 thanks.

8 MEMBER BALLINGER: Okay. So have you --  
9 I'm sure you've got a few things to say, go ahead.

10 MR. DONOGHUE: Oh, just a couple, thank  
11 you. Yes. Scott Krepel, I'll let you know, he led  
12 this review and he recently became a branch chief in  
13 my division, Division of Safety Systems.

14 MEMBER BALLINGER: Congratulations.

15 MR. DONOGHUE: Yes, yes. So he somehow fit  
16 in time to prepare for this meeting. I think he'll do  
17 a great job.

18 So today, you're going to hear about the  
19 Framatome topical report, that included an analysis  
20 method to capture dynamic behavior of fuel assemblies  
21 which could occur during seismic and LOCA events. So  
22 methodology is to show compliance with regulatory  
23 requirements that assure fuel geometry is maintained  
24 for adequate cooling and that control rods can be  
25 inserted.

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1           The supplement adds a new model element  
2 that can be used with the previously approved analysis  
3 to represent unique behavior of certain spacer grid  
4 designs, such as the GAIA spacer grid.

5           I just want to add that the engagement  
6 with the NRC staff and its contractor with Framatome  
7 was very good, very constructive. I want to thank  
8 them for working for a very efficient review, allowing  
9 us to do extensive audit activities. And everything,  
10 yes, that the staff wanted covered besides that order  
11 was covered in a single round of RAIs, despite the  
12 novel nature of what they presented.

13           So I'm going to stop at that point. I'm  
14 going to hand it over, back to you, Member Ballinger.  
15 Thank you very much.

16           MEMBER BALLINGER: Thank you. One more  
17 thing before we turn it over to Brian Painter, and  
18 that is, at the end of the closed session, our  
19 intention is to read-in the draft letter that we have,  
20 so that Framatome can take a look at it to see if  
21 there's any proprietary information that we need to be  
22 careful about in that. So that will be the last thing  
23 that we do in the proprietary session.

24           So Brian, it's your presentation.

25           MR. PAINTER: All right, thank you. So my

1 name is Brian Painter, and I'll be presenting on the  
2 supplement to ANP-10337, and this is for deformable  
3 grids. I'm an engineer at Framatome in the Fuel  
4 Mechanics Department, where I specialize in dynamic  
5 analyses, including seismic and LOCA analysis. So  
6 with that, I'll get started.

7 And for this session, I wanted to touch on  
8 three areas, looking at the base methodology, a quick  
9 overview of the GAIA fuel assembly design, and then a  
10 description of the deformable grid methodology.

11 So starting off with a review of the base  
12 method. As mentioned before, the generic base  
13 methodology for how we do our seismic and LOCA  
14 evaluations for PWR assemblies in ANP-10337, that was  
15 approved recently, in August 2018.

16 And what that report did was it updated  
17 the vertical and lateral dynamic modeling, as well as  
18 how we will perform the component stress analysis. It  
19 addressed the NRC information notice about irradiation  
20 effects on spacer grid strength and it also defined  
21 the spacer grid allowable impact load and the  
22 allowable grid permanent deformations.

23 So in the base method, when we do our  
24 horizontal or lateral seismic and LOCA evaluations,  
25 the spacer grid impact is assumed to be linear, the

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1 response is assumed to be linear, up to the allowable  
2 impact load.

3 But with some new spacer grid designs, in  
4 particular the GAIA spacer grid design, it exhibits a  
5 linear response, but it's limited to small impact  
6 energies, and then it proceeds into a nonlinear  
7 response.

8 So the deformable spacer grid method that  
9 I'm presenting here, it's intended to extend the base  
10 method, but to address spacer grids with these  
11 nonlinear impact responses.

12 Most of the base remains applicable to the  
13 deformable grid supplement. So a lot of important  
14 things, like the fuel assembly beam model, how we  
15 build it, how we determine the frequencies that we're  
16 going to apply, that is unchanged. The system damping  
17 and the hydrodynamic coupling, that is unchanged.

18 We addressed in detail in the base method  
19 how we treat irradiation effects on spacer grid  
20 testing, that is also unchanged. As is how we do the  
21 non-spacer grid component stress evaluations, the  
22 models and the methods that we use there.

23 So really, the deformable grid supplement,  
24 it's replacing the linear grid impact element in the  
25 lateral seismic and LOCA evaluations with a nonlinear

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1 impact element.

2 So a quick review of the GAIA fuel  
3 assembly. And the reason I'm bringing this up is, as  
4 was mentioned and I'll say again, a lot of the impetus  
5 for this method was due to the different response of  
6 the GAIA spacer grid.

7 But the GAIA fuel assembly design is  
8 Framatome's latest design for 17-by-17 Westinghouse  
9 reactors. As I said, the spacer grid itself, it  
10 introduces the nonlinear response to external  
11 excitation as it impacts other neighboring spacer  
12 grids in our evaluations.

13 For small or moderate impact energies, the  
14 grid remains linear. But as we increase the impact  
15 energy, the nonlinearities in the response would  
16 become more important.

17 We did analyze this custom grid design and  
18 the spacer grid design using the linear elastic  
19 response, so conforming to the base method of 10337.  
20 And that was done to support the sample problem in the  
21 GAIA product topical, ANP-10342.

22 And a little bit about the deformable grid  
23 method. As I said, it implements a new nonlinear  
24 deformable spacer grid model, and that is going to  
25 replace the standard linear viscoelastic spring that

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1 we have in the base methodology.

2 And this DGE, deformable grid element, it  
3 can simulate the impact response, the nonlinear impact  
4 response. But importantly, it can also predict the  
5 residual spacer grid deformation that it would  
6 experience, or could experience, in a seismic and LOCA  
7 event.

8 Adding in the DGE and replacing the linear  
9 spring, it doesn't otherwise alter what we're doing  
10 for the fuel assembly dynamic response. As I said,  
11 the way we determine the frequencies of the beam  
12 elements of the fuel assembly model, all that is  
13 unchanged.

14 We are, with the supplement, moving from  
15 a concept of a limiting impact load acceptance  
16 criteria that we defined in the base method and we're  
17 replacing it in the supplement with a limiting  
18 residual deformation.

19 Some acronyms.

20 MEMBER KIRCHNER: Brian, this is Walt  
21 Kirchner. Could you explain to the public, for the  
22 record, why you're doing this? I think I know the  
23 answer, but I would prefer for Framatome to say this.  
24 Could you just give a simple explanation in layperson  
25 speak, rather than techno-speak, as to why you did the

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1 supplement and what it allows you to do?

2 MR. PAINTER: Okay. So the reason we are  
3 creating this supplement is that due to the specifics  
4 of the GAIA spacer grid design and how it responds if  
5 you hit it with a mass that's moving and you try to  
6 crush the spacer grid, its full potential for  
7 absorbing that energy that comes from a mass or an  
8 adjacent fuel assembly hitting it were a little  
9 constrained in the base method.

10 So what we're doing with the deformable  
11 grid element and that supplement is we are reforming  
12 the analysis to take advantage of the strength, it's  
13 nonlinear, but take advantage of the strength and its  
14 ability to absorb larger amounts of energy from  
15 impacts that you would have during seismic and LOCA --  
16 yes, I kind of trailed off there, but --

17 MEMBER KIRCHNER: I don't want to lead the  
18 witness, so to speak, but -- and still retain all the  
19 safety functional design requirements necessary in the  
20 licensing review, yes.

21 MR. PAINTER: Correct. We would conform to  
22 --

23 MEMBER KIRCHNER: As you --

24 MR. PAINTER: -- the requirements.

25 MEMBER KIRCHNER: -- for the public, as the

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1 industry has gone from 15-by-15 to 16-by-16 to 17-by-  
2 17 bundles, the rigidity of the spacer grids has  
3 diminished, but the performance has improved actually,  
4 in terms of critical heat flux and other key safety  
5 parameters.

6 And I think what you're doing with this  
7 supplement is demonstrating that, with these design  
8 improvements, we still meet all the GDCs and other  
9 regulatory requirements necessary to ensure, as you  
10 started off with, that the control rods can still be  
11 inserted in the guide tubes, that the geometry is  
12 retained for coolability, et cetera. Is that a fair  
13 summary?

14 MR. PAINTER: That is a fair assessment,  
15 yes.

16 MEMBER BALLINGER: Okay. That's it, I  
17 guess. This concludes the presentation for the open  
18 session. I think now we need to be sure that the  
19 public line is open and ask for public comments. Is  
20 --

21 MEMBER KIRCHNER: Ron?

22 MEMBER BALLINGER: -- the public line open?

23 MEMBER KIRCHNER: Ron, this is Walt. Does  
24 not the staff get to make a public --

25 MEMBER BALLINGER: Oh, I'm -- oh, shoot,

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1 okay. No, no, I'm misreading the -- wait a minute,  
2 according to the agenda, we go into closed session --

3 MEMBER KIRCHNER: Yes.

4 MEMBER BALLINGER: -- after the public  
5 comments.

6 MEMBER KIRCHNER: Yes.

7 MEMBER BALLINGER: Unless I'm reading this  
8 wrong.

9 MR. BROWN: You're correct, Ron.

10 MEMBER BALLINGER: Huh?

11 MR. BROWN: You're correct, Ron.

12 MEMBER BALLINGER: Okay.

13 MEMBER KIRCHNER: But then does the staff  
14 make a presentation after the closed session?

15 MR. BROWN: Yes, we're doing exactly what  
16 we did in the subcommittee.

17 MEMBER KIRCHNER: Okay, thank you. I got  
18 the sequence wrong, my error.

19 MEMBER BALLINGER: Yes, the staff  
20 presentation is fully within the closed session.  
21 Okay. So we -- let's -- is the public line open? I'm  
22 not hearing anything. Can we check to see if the  
23 public line is open?

24 (Simultaneous speaking.)

25 MR. DASHIELL: Public line is open.

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1 MEMBER BALLINGER: Thank you. Are there  
2 members of the public that would like to make a  
3 statement? Please state your name, and then your  
4 statement.

5 Hearing none, I think we now need to ask  
6 Derek to -- this ends the open session, we need to  
7 transfer to the closed session. We need a few minutes  
8 I think --

9 CHAIR SUNSERI: Yes, he's --

10 (Simultaneous speaking.)

11 CHAIR SUNSERI: Derek has sent the closed  
12 session invitation out.

13 MEMBER BALLINGER: Oh, he did? Okay. I'm  
14 --

15 CHAIR SUNSERI: You should have --

16 MEMBER BALLINGER: I'm not good at  
17 multitasking. I didn't get it.

18 VICE CHAIR REMPE: It went only to your NRC  
19 email, folks. So yes, you'll need to either forward  
20 that invitation to your private emails or use your NRC  
21 computer.

22 MEMBER BALLINGER: Unfortunately, my NRC  
23 computer is not functioning.

24 VICE CHAIR REMPE: So I'm going to forward  
25 it to you, Ron, okay?

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1 MEMBER BALLINGER: Okay, thank you.

2 VICE CHAIR REMPE: You're welcome.

3 CHAIR SUNSERI: Does anybody else, any  
4 other member have a restraint on using their NRC  
5 computer and they need it forwarded to them?

6 VICE CHAIR REMPE: And, Ron, it's in the  
7 internet, so hopefully you'll get it soon. And does  
8 anybody else have an issue?

9 MEMBER BALLINGER: Joy -- I didn't get it  
10 yet.

11 CHAIR SUNSERI: Okay. It should be coming.  
12 Anyway. All right. So we will take a few minutes  
13 here to transition. We'll go into closed session and  
14 we will resume at 3:00 p.m. in closed session. I  
15 anticipate that that will take until around 4:00 p.m.,  
16 of which then we will come back into the open session  
17 and provide any public comments that we can as a  
18 result of our work during closed session.

19 So right now, we are going into recess.  
20 We will reopen at 3:00 in closed session, and we will  
21 return to open session at 4:00. Thank you.

22 (Whereupon, the above-entitled matter went  
23 off the record at 2:51 p.m. and resumed at 4:30 p.m.)

24 CHAIR SUNSERI: Well good afternoon, this  
25 is Matt. It's 4:30 and we will come to order here.

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1 I will start with a roll call of the members. Ron  
2 Ballinger?

3 MEMBER BALLINGER: Here.

4 CHAIR SUNSERI: Dennis Bley?

5 MEMBER BLEY: Here.

6 CHAIR SUNSERI: Charles Brown?

7 MEMBER BROWN: Here.

8 CHAIR SUNSERI: Walt Kirchner?

9 MEMBER KIRCHNER: Here.

10 CHAIR SUNSERI: Dave Petti?

11 MEMBER PETTI: Here.

12 CHAIR SUNSERI: Joy Rempe?

13 VICE CHAIR REMPE: Here.

14 CHAIR SUNSERI: Pete Riccardella?

15 MEMBER RICCARDELLA: I'm here.

16 MEMBER DIMITRIJEVIC: And Matt, I am here  
17 too, I made it back.

18 CHAIR SUNSERI: Oh, thank you, Vesna,  
19 thanks for announcing, all right, Vesna. And Jose  
20 will not be with us. Okay.

21 So just let me recap where we are, just to  
22 close out the topical report on deformable spacer  
23 grid, we did have the closed session, where we heard  
24 from both the Framatome and the staff on some  
25 technical aspects of that that are being protected for

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1 proprietary purposes.

2 We offered Framatome a draft report to be  
3 reviewed for proprietary content, which they are doing  
4 that now. So soon as we get word back from them on  
5 that report and any proprietary material that might be  
6 in there, we'll redact or whatever we need to do, and  
7 then we will begin editing that report in the public  
8 forum, more likely, well it will be tomorrow before we  
9 can get to that one.

10 As far as going on forward today, we are  
11 in our report preparation period, this will be the  
12 last session of the day. We don't have very many  
13 options for continuing, since we are waiting on the  
14 proprietary report on the deformer spacer grid.

15 We are in the same situation with the  
16 BWRX-300. In addition, our lead member is not  
17 present, so we can't take on that report.

18 That leaves us with Member Bley and the  
19 Part 53 report. When we left that one off earlier  
20 today, we were at kind of a focus group discussion on  
21 major points that we should offer as far as ideas to  
22 include in our response.

23 So at this point, Dennis, I would like to  
24 ask you to pick this topic up and see how far we can  
25 go with it. I'm not sure if we will actually get into

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1 any letter editing tonight, because we haven't  
2 finished the major points yet, but I'll let you take  
3 it over from here and let me know when you think that  
4 we've drawn that to a conclusion.

5 MEMBER BLEY: Okay. Well before I do that,  
6 I thought as we left the closed session with Ron that  
7 you wanted to come back to Ron in the open session and  
8 either do a summary or mention something. But if not,  
9 I'll go ahead.

10 CHAIR SUNSERI: Yes, so I think I just read  
11 --

12 MEMBER BLEY: Okay.

13 CHAIR SUNSERI: Yes. So go ahead.

14 MEMBER BLEY: I'm going to ask Derek to put  
15 my comments back up there for people to see and work  
16 from. And at the same time, I'll mention that I do  
17 have a draft letter I've prepared, but that's before  
18 our full discussion, and I'm interested in what  
19 everybody else has to say.

20 And I will mention that Dave Petti and I  
21 had a kind of set of comments going back and forth  
22 about his points on fusion, and if you haven't seen  
23 those, you might want to take a look, there's some  
24 interesting issues.

25 After seeing his comments, I think we

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1 ought to have at least something about fusion in here,  
2 whether it goes up in conclusions and recommendations  
3 or it's just a short discussion in the letter, we can  
4 talk about.

5           And the other thing I had offline some  
6 trades of notes with Joy, who had brought up the  
7 transportation issue. And we heard from the staff,  
8 not in the Part 53 meeting, but in some other  
9 discussions, that some vendors are thinking of  
10 shipping these things whole to the site, which isn't  
11 a surprise, but also shipping them back.

12           And the transportation issue comes up as  
13 one that could be interesting. We traded some  
14 information, I think I'd like to hold this one off  
15 until we have our next meeting with the staff, but  
16 we'll let them know. Because right now, NRC's scope  
17 of control, regulatory control on transportation is  
18 really limited by memos of understanding with other  
19 government agencies to certifying the transportation  
20 casks for spent fuel, and all the shipping parts of it  
21 belong to a host of other agencies, both local, state,  
22 and federal government, dozens of them involved.

23           But some of these new issues might mean  
24 that those agreements weren't contemplating some of  
25 the things that might be contemplated in the future.

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1 So I think we do want to talk with the staff, but I  
2 think for me it's premature to say anything  
3 significant about that.

4 So at this point, I will turn it over to  
5 whoever wants to speak next. And you can stick to the  
6 issues I sent you on that list, which I think you all  
7 have, or you can talk about anything you think we  
8 ought to consider. So who's up?

9 MEMBER KIRCHNER: Dennis, I'll take a stab,  
10 this is Walt. With your list, one that I had brought  
11 up with the staff this morning, it kind of fits in two  
12 places, hand-in-glove with both Charlie's comments on  
13 the GDCs, which you have a bullet for, and that is  
14 definitions.

15 And the other place where definitions fit  
16 in is with defense-in-depth. And the reason I say  
17 that, like I paraphrased the 50.2 definition for what  
18 is safety-related for LWRs, it's kind of the companion  
19 to your risk triplet.

20 And it's the big three. It's control and  
21 shutdown of reactivity. It's preservation of the  
22 primary lines of defense. And it's in the end result,  
23 it's dose. So it's a variant on the risk triplet, in  
24 a -- more from a deterministic approach rather than  
25 from a probabilistic approach.

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1           But it seems to me clarification of those  
2 kind of issues and there's one more I would throw in  
3 that I don't think is on your list, or I missed it, is  
4 quality assurance. Those seem to me to be in the  
5 category of things that early resolution would be  
6 important. Maybe it's on the second page and I missed  
7 it. So that's my three cents.

8           MEMBER BLEY: I don't remember it being  
9 there, Walt. Now, we're going to have lots of  
10 opportunities to dig into things, and are these things  
11 you think we really need to bring up at this point, or  
12 are they things we want to talk with the staff as we  
13 go along and try to reach resolution?

14           MEMBER KIRCHNER: My sense is these are  
15 things that should be resolved early in putting a  
16 framework together for 53.

17           I'm almost sounding pedantic when I keep  
18 saying definitions, but I believe that it's rather  
19 fundamental and I concur with Charlie's comments, even  
20 if it's not the GDCs in the sense that we know them,  
21 all 50-some of them or whatever the total number is,  
22 some high level, if indeed they're not going to adopt,  
23 I would expect that they would use the Reg Guide that  
24 they worked on for the Advanced Reactor Design  
25 Criteria and refer to that, but they mentioned this

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1 morning higher level.

2 To first order, if you look at the  
3 existing Appendix A GDCs, there are categories there.  
4 There's the first five, and then there's -- I don't  
5 remember the headings for them, but they have them  
6 nicely divided into kind of higher level topical  
7 areas.

8 MEMBER BLEY: Now I got it on my new list  
9 of checkpoints, but I guess my own feeling is they're  
10 thinking about that, they're working on how they're  
11 going to do it, and that doesn't seem like something  
12 we need to raise a flag on at this time, but it's a  
13 Committee letter, so if we really want to include  
14 that, we can.

15 But they're talking about having something  
16 at a higher level, but having -- it wasn't a Reg  
17 Guide, I think it was just a paper on the ARDCs. And  
18 that will almost certainly be guidance for how you  
19 meet high level criteria.

20 MEMBER KIRCHNER: Yes.

21 MEMBER BLEY: But as far as what --

22 MEMBER KIRCHNER: I guess the issue was, as  
23 --

24 MEMBER BLEY: -- you're talking about --

25 MEMBER KIRCHNER: -- Charlie said, I mean

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1 are you going to put some higher level version of the  
2 GDCs in the actual 10 CFR 53, or are you going to just  
3 use Regulatory Guidance?

4 MEMBER BLEY: Oh, I -- at least to me,  
5 there's no question they're going to put something and  
6 it's going to be in the text of Part 53 and we're  
7 going to interact with them on that a lot as we move  
8 forward.

9 What I'd really like this letter to do is  
10 to flag things that either might be a surprise to them  
11 or a surprise to the Commission, given the background  
12 of information that's available. Now probably  
13 nothing's a surprise to the staff, they are thinking  
14 about most of these things.

15 VICE CHAIR REMPE: Walt, your comment,  
16 you're mentioning the critical safety functions, is it  
17 that you want something about the GDCs related to the  
18 critical safety functions, the three, control  
19 radioactivity release, reactivity -- or a radionuclide  
20 release, reactivity, and heat removal? I didn't  
21 understand the link --

22 MEMBER KIRCHNER: Well the link is --

23 VICE CHAIR REMPE: -- in your comment to  
24 this question.

25 MEMBER KIRCHNER: Those three that are

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1 singled out when they define safety-related really are  
2 a higher level version of the GDCs. The GDCs --

3 VICE CHAIR REMPE: Okay.

4 MEMBER KIRCHNER: -- then go --

5 VICE CHAIR REMPE: Now, I understand why --

6 MEMBER KIRCHNER: -- on and --

7 VICE CHAIR REMPE: -- you're linking it --

8 MEMBER KIRCHNER: Yes, that's why --

9 VICE CHAIR REMPE: -- just didn't, so --

10 MEMBER KIRCHNER: -- I'm linking it.

11 VICE CHAIR REMPE: -- thank you.

12 MEMBER PETTI: So Dennis, the other thing  
13 I thought about, or maybe I'm completely wrong here,  
14 is that this letter would help the staff understand  
15 some of our concerns early, so that when they're out  
16 doing all this public interfacing, and you know  
17 there's going to be a lot of push to water down  
18 requirements frankly, because I think many in that  
19 community think that these requirements are onerous  
20 and don't have a strong technical basis.

21 I think they're naive, because they don't  
22 really understand, many of them don't understand the  
23 thought process, whereas legacy vendors that have  
24 concepts, they get it.

25 This would help them understand sort of

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1 where our position is on some big ones as they get  
2 into more of this public interaction, and that might  
3 be helpful to them. That was my only thing.

4 MEMBER BLEY: This could be a very long  
5 letter, and we could summarize everything we wrote in  
6 our half a dozen letters on various aspects of the  
7 vision and strategy for new reactors. They've got all  
8 those letters.

9 There was something Walt and Joy were just  
10 saying that I do kind of like and talking about that  
11 structure of what are we really interested in at a  
12 high level, if it's taking indicators or whatever, and  
13 how those spin down into the ARDC and very specific  
14 issues going deeper might be a useful concept for  
15 them.

16 And I don't think they've ever laid that  
17 out. They probably laid it out in their heads, but  
18 they probably haven't written it down anywhere that  
19 I've seen.

20 So give me a sense of -- like I said, I  
21 have a draft letter, you should have it now.

22 MR. CORRADINI: Dennis?

23 MEMBER BLEY: But which things do we want  
24 to add to it, and do we want this to be 30 pages  
25 summarizing everything we've said in the last two

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1 years in this area, or do we want to really focus on  
2 just a few? Yes, whoever that was?

3 MR. CORRADINI: Yes, this is Mike. Just  
4 you had three bullet points on the shorter letter  
5 which I thought were appropriate. The one thing that  
6 is going to confuse the community compared to the NRC  
7 is what a prototype is.

8 And there was a 2017 white paper which you  
9 mentioned in your discussion that I think staff ought  
10 to at least revise or relook at, so that industry  
11 really understands what a prototype is, because at  
12 least to the NRC, it's very specific, at 50.43(e)(2).  
13 And I think it's used much more generally otherwise.

14 And Dave asked a question to the staff  
15 about what is considered, I'll call it additional  
16 features? And I think some sort of guidance there  
17 about a prototype from the NRC's perspective is  
18 important, so that there's no miscommunication with  
19 industry.

20 MEMBER BLEY: Oh, I absolutely agree and I  
21 thought it -- well, I didn't get it into my notes,  
22 because for some reason it wasn't in my head while I  
23 was scribbling them out, but it made it into my draft  
24 letter.

25 MR. CORRADINI: Right.

1 MEMBER BLEY: I think --

2 MR. CORRADINI: Right, your --

3 (Simultaneous speaking.)

4 MEMBER BLEY: -- the prototype. The paper  
5 you mentioned, I think is really thoughtful and  
6 thorough. And it's a follow-on to that SECY that Ron  
7 sent around to everybody --

8 MR. CORRADINI: Right.

9 MEMBER BLEY: -- which is many years older  
10 than this. Let me look.

11 MEMBER KIRCHNER: Dennis, do we have --

12 MEMBER BLEY: Do we have any staff people,  
13 are there any NRC staff people on the call from the  
14 Part 53 work?

15 MS. VALLIERE: Yes, Dennis, this is Nan  
16 Valliere, I'm on the line.

17 MEMBER BLEY: Hi, Nan. I don't know what  
18 happened to it, somehow I have a copy of a preliminary  
19 draft paper from June 14, 2017, it was entitled  
20 Nuclear Power Reactor Testing Needs and Prototype  
21 Plants for Advanced Reactor Designs.

22 Did that ever get finished, or is that  
23 something you folks are using or is that something we  
24 can get a real version of instead of the one I happen  
25 to have? I haven't circulated it, because I don't

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1 know its pedigree at all.

2 MS. VALLIERE: Yes, so I believe the one  
3 you have is the one that Amy was referring to in  
4 today's meeting and that that is the latest version.  
5 It is, if it's the one I'm thinking of, it is publicly  
6 available on our website.

7 MEMBER BLEY: Oh, good, it's --

8 MS. VALLIERE: I can double-check that with  
9 Amy.

10 MEMBER KIRCHNER: Nan, can you -- this is  
11 Walt Kirchner. Can you provide that to Derek and he  
12 could then distributed it to the Committee members?

13 MS. VALLIERE: My understanding is Amy has  
14 already provided it to Derek.

15 MEMBER KIRCHNER: Okay, thank you.

16 MS. VALLIERE: Yes.

17 MEMBER BLEY: Okay, good. Yes, the version  
18 I have is labeled preliminary draft and I don't know  
19 if that's still appropriate.

20 MR. WIDMAYER: Okay, well --

21 MEMBER BLEY: It made me hesitant to send  
22 it around.

23 MR. WIDMAYER: This is Derek.

24 MEMBER BLEY: Hey, Derek.

25 MR. WIDMAYER: Yes. Amy did send me what

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1 she was referring to and it's the Roadmap. So I don't  
2 know if what you're talking about has been consumed  
3 into the Roadmap, I'll have to verify that with Amy.

4 MS. VALLIERE: Yes, and --

5 MEMBER BLEY: Okay.

6 MS. VALLIERE: -- while you're talking,  
7 I'll also look through our documents and see if I can  
8 verify that here, as we're on the line.

9 MEMBER BLEY: Okay. Maybe it shouldn't be  
10 out there, but if out on the open net you Google  
11 prototype plants and NRC, it pops right up.

12 MS. VALLIERE: Yeah, no, I think it, as I  
13 said, I believe that we made it publicly available at  
14 that time. I apologize, that was before I joined the  
15 group, but that is my understanding, that it was made  
16 publicly available at that time, despite its labeling.

17 MEMBER BLEY: Okay. And we might have had  
18 it at a meeting back then, because I don't remember  
19 for sure, but it's a pretty nice document. So if you  
20 can do that, we will appreciate it.

21 MS. VALLIERE: Certainly.

22 MEMBER BLEY: And, Mike, we will address  
23 thinking about the prototype and the ways you can go  
24 about that in the letter. Anything else, Mike?

25 MR. CORRADINI: No, other than I think

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1 keeping your initial letter short and inviting the  
2 staff for frequent interactions is really the way to  
3 go, rather than putting in a long letter here.

4 You can always include references as to  
5 where we made comments in the past, but I think a  
6 short letter picking on the two or three points that  
7 you identified at the top of your discussion notes are  
8 the appropriate approach.

9 MEMBER BLEY: Thank you. Let's go to  
10 anybody --

11 MEMBER BALLINGER: This is Ron. To follow  
12 up a bit, we've been going back and forth on this  
13 prototype issue and I've been making what some people  
14 might consider heretical comments about the need for  
15 a prototype.

16 So I think that we really need to go after  
17 making sure that, A, the definition of a prototype,  
18 what it is, when it's needed, and, because of the  
19 advances in modding and simulation and other things  
20 that have been going on over the last say 20 years, we  
21 sort of default, we need a prototype, to any new  
22 reactor type.

23 And that may be true still, but it may be  
24 that that needs to be thought through a little bit  
25 more carefully because a prototype is a very, very

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1 expensive and time consuming operation. And it may be  
2 needed, like Walt says, but we ought to be sure that  
3 before we --

4 MEMBER KIRCHNER: No, I didn't say it may  
5 be needed, I just -- I want to qualify that, it  
6 depends.

7 MEMBER BALLINGER: Yes, okay. I just hope  
8 that we can define what depends is.

9 MEMBER KIRCHNER: Yes. Well it's --

10 MEMBER BLEY: On the other hand, it's not  
11 as expensive as an accident. Go ahead, Walt.

12 MEMBER KIRCHNER: Well I was just going to  
13 say, Dennis, just for further reference for everyone,  
14 there is a defined definition in the regulations for  
15 what a prototype is. I'll give you the shorthand, it  
16 won't take long to do it.

17 A prototype plants means an NPP to test  
18 new safety features, similar to a first-of-a kind or  
19 standard plant design, and all features and size,  
20 quote/unquote.

21 And then in 10 CFR 52, I'll commend  
22 everyone to look at 47, Ron. It does --

23 MEMBER BLEY: I have --

24 (Simultaneous speaking.)

25 MEMBER KIRCHNER: There's a number of -- so

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1 obviously the staff or the predecessor staff has  
2 worked on this kind of issue before at great length.  
3 And it says there, one of the interesting ones, it  
4 says performance of each safety feature of the design  
5 has been demonstrated either through, listen to this,  
6 analysis, appropriate test programs, experience, or a  
7 combination thereof. And then there are many other  
8 criteria; I won't go through them.

9           So there is a body of regulatory precedent  
10 regarding prototypes. It may not be what some of the  
11 advanced reactor designers want to hear. And this  
12 will be interesting for the staff when they consider  
13 importing parts of 50 and 52 into 53. But certainly,  
14 it was addressed in previous regulatory space.

15           MEMBER BLEY: And it kind of got added in  
16 -- let me take a second to give you a little history,  
17 because I just had to refresh myself on this for  
18 another purpose recently.

19           Ron brought up 103 license and 104  
20 license. Originally in the Atomic Energy Act, 103 was  
21 for commercial reactors. 104 was for three different  
22 kind of reactors, test reactors, test and research  
23 reactors, demonstration reactors, essentially  
24 prototypes, first-of-a-kinds, and then there was a  
25 third one.

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1           After the first ten or 15 years of  
2 starting to build -- and they built a whole bunch of  
3 interesting and curious designs back then, very small  
4 ones for the most part, but some big ones.

5           And they were all licensed under 104,  
6 because we hadn't established a database of operating  
7 experience. And nobody did the transition to 103,  
8 which they expected, which Congress expected to  
9 happen. There were practical reasons that made it  
10 easier to do one than the other, and somewhat less  
11 expensive. And NRC was not pushing it either, or AEC.

12           Congress got kind of upset, because we had  
13 a bunch of plants running for quite a few years and  
14 not making that transition, and they eliminated the  
15 104(b), which were the demonstration reactors. And  
16 that's where people say the Atomic Energy Act  
17 eliminated prototypes. And it was really to get them  
18 into the mode of doing everything you're supposed to  
19 do with commercial reactors.

20           MEMBER BALLINGER: Wasn't Fort St. Vrain a  
21 104 reactor?

22           MEMBER BLEY: Almost all of the first  
23 reactors were 104 reactors, even some of the big ones.

24           MEMBER BALLINGER: Okay.

25           MEMBER BLEY: But you can't do a 104(b)

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1 anymore. It's still there, but it applies only to  
2 designs that were presented to the AEC before some ---  
3 in 60.

4 But NRC, as Walt was telling you, worked  
5 prototypes into the regulations for Part 50 and Part  
6 52, at least in principle. So that's kind of where it  
7 all came from.

8 There is talk of maybe licensing some of  
9 the new reactors under 104 as test reactors. But then  
10 you get that issue of how do you transition and make  
11 them commercial?

12 Where if we can get this paper to  
13 everybody, the place the staff was a few years ago was  
14 saying, you get a 103 license, but it has all these  
15 constraints or extra requirements.

16 And as you meet them and develop operating  
17 experience, they can be relaxed, and it might be  
18 through a license amendment or it might be through  
19 meeting conditions that are built into the license.

20 So mechanisms are there, but it's mostly  
21 not expected to be a 104, but you can't do 104(b), it  
22 would have to be 104(a), which would call it a test  
23 reactor. That probably, not probably, that really  
24 limits the size a lot. Mike may remember what that  
25 is. I don't remember; it's very small.

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1 MEMBER KIRCHNER: Well it used to be 10  
2 megawatts.

3 MEMBER BLEY: I think it still is --

4 MEMBER KIRCHNER: And --

5 MEMBER BLEY: -- I think it's that small.

6 MEMBER KIRCHNER: And this may be  
7 heretical, but I can see the challenge for the staff,  
8 they're trying to now craft a new set of regulations  
9 one-size-fits-all, technology neutral, et cetera, et  
10 cetera, et cetera.

11 I'm almost -- this is a terrible thing to  
12 say late in the afternoon, maybe we're better off with  
13 having a ten megawatt breakpoint for test and  
14 experimental reactors, and then reactors that are  
15 serious about generating large-scale power fall under  
16 10 CFR 53 or 52. It almost -- you don't have to  
17 answer that, Dennis.

18 MEMBER BLEY: We have lots --

19 MR. CORRADINI: Just one clarification --

20 MEMBER BLEY: -- we can talk about --

21 (Simultaneous speaking.)

22 MR. CORRADINI: One clarification though,  
23 I think the NPUF rule has gone away from the size of  
24 the reactor and it's gone into the dose requirements  
25 at the boundary. If Matt is remembering what we went

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1 through and then the rule and then the revised rule  
2 that we wrote a letter on, what was it, two years ago,  
3 Matt?

4 CHAIR SUNSERI: Yes, I think you're right,  
5 Mike, it did change that.

6 MEMBER KIRCHNER: I'm almost thinking that  
7 using the NPUF rule for smaller micro-reactors, or  
8 whatever they're going to be called, is a more  
9 profitable exercise than trying to craft something  
10 that is really directed towards large-scale, large-  
11 megawatt power generation.

12 VICE CHAIR REMPE: I don't think NPUFs can  
13 be applied to facilities that are used for power  
14 production, electrical power production, is the  
15 problem.

16 MEMBER KIRCHNER: I know, Joy, you're  
17 correct.

18 MEMBER BLEY: But there are, for writing  
19 rules, there are ways around that too. So Part 53  
20 could actually have multiple parts for different  
21 sizes. A lot of things we can talk about over the  
22 next few years. Back to our list, or your own lists,  
23 so far --

24 MEMBER DIMITRIJEVIC: Dennis?

25 MEMBER BLEY: -- we've added fusion, at

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1 least in some way. We may have added GDCs. We may  
2 have added defense-in-depth and QA. I kind of hope  
3 not, I want to talk more about those. What other  
4 areas that others of you are interested in or think we  
5 ought --

6 MEMBER DIMITRIJEVIC: Dennis?

7 MEMBER BLEY: -- to include? Yes?

8 MEMBER DIMITRIJEVIC: Hi Dennis, okay. Now  
9 I maybe -- and I really struggle a lot with this and  
10 I'm not sure where the place to introduce something  
11 like that, then I ask today about this.

12 This has risk-informed as their first  
13 thing. So obviously, there will be these  
14 qualifications or estimates and there will be these  
15 matrix and we talk about the inputs to use, initiating  
16 events and the scenarios and things like that.

17 What really bothered me a lot when we were  
18 doing NuScale is that NuScale came with that model,  
19 claiming that their risk is ten to minus nine, which  
20 will make it negligible. And then in ranking, risk  
21 ranking of the SSCs, they allowed the components which  
22 will increase this risk thousand times to be called  
23 unimportant, because you're still within coolant  
24 safety goals.

25 And that really bothered me for a long

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1 time, even when we were doing the tabletops for the  
2 new reactors, should be absolute or relative? And  
3 what I was thinking is the general. Will be  
4 interesting if actually incoming plants can be sorted  
5 in the risk categories, like negligible risk or low  
6 risk, between ten to minus six or ten to minus eight,  
7 or the coolant risk.

8 And then you cannot -- anything which will  
9 get you out of that category is important. You have  
10 to stay within -- if you're claiming that your risk is  
11 negligible, then you cannot claim the components and  
12 not say it is significant if their malfunction will  
13 get you out of that category. So --

14 MEMBER BLEY: Vesna --

15 MEMBER DIMITRIJEVIC: -- basically  
16 important components maintain risk which you claim is  
17 your risk. Either you have to maintain low risk in  
18 order to claim that this component is not important,  
19 if you understand what I want to say.

20 So I was thinking that there can be some  
21 risk categorization of the applicants and based on  
22 this risk categorization, some regulation can apply  
23 for the plants which come claiming they have a  
24 negligible risk. The plants who have a low risk, the  
25 existing fleet, the plants coming with the risk

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1 belonging to existing fleet.

2 MEMBER BLEY: Vesna, I like that idea. I  
3 think I'm kind of nervous about putting something that  
4 we haven't really bashed around a lot into this  
5 letter, but I think if we could get a few folks  
6 together and do up a white paper on that area and then  
7 present that to the staff and ask them to consider it  
8 and talk about it at one of our future meetings, of  
9 which I expect quite a few, I think it's a really good  
10 idea. I will not lose it; I have it written down  
11 here.

12 MEMBER DIMITRIJEVIC: Okay, all right. All  
13 right. But yes, I mean I like that this is very short  
14 and right to the point, I know there will be so many  
15 discussion, I just I wasn't sure where certain ideas  
16 can enter, and I like your idea that we write the  
17 white paper on it.

18 MEMBER BLEY: Yes. So let's not forget  
19 about that.

20 (Laughter.)

21 MEMBER KIRCHNER: Dennis?

22 MEMBER BLEY: And I promise I won't. Yes,  
23 who's next?

24 MEMBER KIRCHNER: Dennis, this is Walt. I  
25 like Vesna's idea too. And I still then would pose

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1 one last thing though. So say, as Vesna kind of  
2 schematically laid out the waterfront there for  
3 different designs, what is the minimum defense-in-  
4 depth required for a power reactor, no matter which  
5 bin it falls in?

6 MEMBER BLEY: Are you asking --

7 MEMBER KIRCHNER: That was a rhetorical  
8 question.

9 MEMBER BLEY: Yes.

10 MEMBER PETTI: So Walt, let me --

11 MEMBER BLEY: That is not defined anywhere.  
12 But go ahead.

13 MEMBER PETTI: Let me -- I have been doing  
14 some work looking at micro-reactors and looking at  
15 NPUFs, and there are actually some papers out there by  
16 NRC and lab people jointly that basically NPUFs, the  
17 way defense-in-depth is interpreted and redundancy and  
18 diversity are interpreted is not the same as the  
19 larger reactors.

20 In fact, there's much more flexibility.  
21 For instance, in reactor shutdown control and  
22 protection, we usually think of separate redundant  
23 trains, and sometimes even redundant systems, for  
24 shutdown and control.

25 That's not the case for many NPUFs. And

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1 I'm talking about the NIST reactor right there in  
2 Mellon, the MIT reactor, the Missouri reactor, I mean  
3 these are high power density machines. And it was  
4 interesting that they -- in the details, there is some  
5 wiggle room when you get to smaller reactors. And  
6 those are important things to understand.

7 Similarly, defense-in-depth, they don't  
8 consider. And the span of accidents that they looked  
9 at is not as broad. So there's a couple papers that  
10 I can dig up and send to folks. I found it  
11 fascinating to -- and these are maybe ten years old,  
12 I think I can't --

13 MEMBER KIRCHNER: Yes, Dave, I was thinking  
14 about the same thing over lunch. And then the one  
15 thing that always comes back into my head is that the  
16 big difference between a micro-reactor and an NPUF  
17 reactor is that usually the NPUF reactor, you're  
18 trying to make neutrons for experiments and such.

19 And usually, even though like you say they  
20 can be high power density, they usually have ample,  
21 how should I say it, thermal margins. Whereas a power  
22 reactor, by definition, to make electric, you want a  
23 high Carnot efficiency, and that drives you to higher  
24 temperatures -- much higher temperatures than NPUF  
25 reactors operate at. And that's a distinguishing

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1 difference.

2 MEMBER PETTI: Yes, well I --

3 MEMBER KIRCHNER: So it's going to be  
4 interesting.

5 MEMBER PETTI: I will say, I mean the  
6 micro-reactor stuff that I've been involved with, the  
7 traditional sets of transients that we think about,  
8 because of the high surface to volume ratio, they're  
9 nothing, these reactors just cool down.

10 These are gas reactor kind of systems,  
11 where there's just a much higher surface to volume  
12 ratio. And they run cooler, in terms of peak  
13 temperatures. And then in terms of accidents, you  
14 don't even see the accident event.

15 So it's really interesting, and getting  
16 that sort of information on some of these other  
17 concepts will be very helpful, I think focus and think  
18 about the problems, because there's nothing like some  
19 accident analysis to help you, guide your thinking.

20 VICE CHAIR REMPE: So along those lines, a  
21 couple of points. I agree with what you're saying,  
22 Dennis, about let's delay the discussion about  
23 transportation into the licensing basis.

24 But when we talk about your second bullet,  
25 for a clean sheet of paper, and the fact that the

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1 staff, in Slide 5, talks about the project life cycle,  
2 and what I think should be considered as you're  
3 writing that up, I'd sure like to see the word not  
4 only construction, operation, and retirement, but also  
5 transportation to and from the site and installation,  
6 if applicable, for the micro-reactors.

7 Because I think it's good, as you've  
8 pointed out in this initial letter, to give people a  
9 heads-up that we're going to be thinking about some  
10 things that I have not seen put in the staff's slides.  
11 And so I'd like to see that emphasized there.

12 MEMBER BLEY: I knew you didn't mean okay  
13 when you sent that to me.

14 VICE CHAIR REMPE: Yes, well the okay was  
15 on the licensing basis, but when I --

16 (Laughter.)

17 VICE CHAIR REMPE: -- was listening to  
18 this, I go, I just have, I did earlier say it could be  
19 put in either of those two bullets, just a little bit  
20 of slip in to give people a heads-up on that one.

21 The other thing I wanted to talk about is,  
22 I actually looked back through the transcript and I  
23 didn't see us comment about this first bullet and the  
24 SECY and how that they had said this.

25 And I like your thoughts about this,

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1 because how do you get rid of a regulatory basis  
2 document and instead just have extensive public  
3 outreach? Did I just miss it when I looked through  
4 the transcript? I didn't hear any discussion on that  
5 today. And how are they going to do this?

6 MEMBER BLEY: Well -- okay. The only way  
7 they can do this is if the Commission says do this.  
8 Because it's not written in a regulation that you need  
9 these things, it's from the Commission. And it's  
10 controlled by Management Directives, and that's what  
11 they're asking exception to. And this is still an  
12 open session, right, Matt?

13 VICE CHAIR REMPE: I think we would have a  
14 --

15 CHAIR SUNSERI: Yes, yes, it's open  
16 session.

17 MEMBER BLEY: Okay. Then we can't talk  
18 about some things that could help answer your  
19 question, Joy.

20 VICE CHAIR REMPE: Okay. Because we've  
21 never discussed it, and the SECY itself is open, and  
22 I just am kind of curious about this, because I  
23 haven't --

24 MEMBER BLEY: Are you --

25 VICE CHAIR REMPE: -- seen us discuss it.

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1 MEMBER BLEY: Say that again? In the SECY,  
2 it's open, what's that mean?

3 VICE CHAIR REMPE: Yes, I actually did a  
4 check today and that SECY is open now, is my  
5 understanding, I could pull it up. Even though --  
6 they crossed through the line saying it's not open.

7 MEMBER BLEY: The SECY is open --

8 VICE CHAIR REMPE: Yes.

9 MEMBER BLEY: -- but the Commissioners have  
10 to vote on the SECY and issue a SRM back to the staff  
11 on what to do with this rule. The SECY was a plan for  
12 rulemaking, but it's not executed until the Commission  
13 comes back with their SRM, which they have not yet  
14 done.

15 So anything one knows by rumor or other  
16 way about where Commissioners sit on this is way  
17 predecisional, we can't talk about it.

18 VICE CHAIR REMPE: But can we talk about  
19 our thoughts a little bit as a group before you try  
20 and draft this as a bullet in the letter? Because I'm  
21 just real --

22 MEMBER BLEY: If you're right, if it wasn't  
23 in the transcript, and I'm not going to go search, I  
24 know it was in the materials and I know --

25 VICE CHAIR REMPE: Yes.

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1 MEMBER BLEY: -- they talked about it --

2 VICE CHAIR REMPE: In the SECY.

3 MEMBER BLEY: -- in their slides and nobody  
4 objected, so I wanted to just say, we don't disagree.  
5 But if it wasn't in there at all, then we probably  
6 shouldn't have it, we should delete it.

7 VICE CHAIR REMPE: So you're planning to  
8 delete that bullet totally? Because they have asked  
9 for it in the SECY.

10 MEMBER BLEY: Yes, they did. So well we're  
11 having a discussion now. This is why we're having the  
12 discussion. So if we want to talk about that, it's  
13 not breaking a rule of any sort, it's changing what  
14 the Commission has asked the staff to do to prepare  
15 for a rulemaking and carry one out.

16 And even ANPR is something that's not  
17 required by any rule or law, but the rulemaking is  
18 required and there are one or two, I forget, I looked  
19 it up a while ago, one or two Management Directives  
20 that tell the staff how to go about preparing a new  
21 rule and who does what in that whole process. And  
22 among those things is a requirement for the staff to  
23 do a regulatory basis document.

24 The argument the staff's put forward, and  
25 others have put forward as well, is that this has been

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1 going on a long time and most all the things that  
2 would go in a regulatory basis document have been out  
3 on the street for several years.

4 And they're planning to have lots of --  
5 the main reason to have that is to give the public a  
6 chance to comment, so they're having many public  
7 meetings where people can comment. And I expect they  
8 will, this will be granted, but I thought we might  
9 want to take a position on it.

10 MEMBER KIRCHNER: Dennis? Dennis --

11 MEMBER BLEY: Yes?

12 MEMBER KIRCHNER: -- this is Walt. You  
13 certainly, of the Committee, have put the most effort  
14 and have probably the most background on this, let me  
15 put you on the spot. What's your opinion? Do we need  
16 this if they go ahead with a lot of extensive public  
17 outreach?

18 MEMBER BLEY: My opinion is no, it's  
19 perfectly reasonable to do this. But also there have  
20 been rumors that maybe they won't even do an ANPR,  
21 advance notice of public rulemaking, which would be  
22 unusual.

23 I went back and talked to, one good friend  
24 of my was in OGC, the General Counsel's Office, for  
25 many, many years and served in many roles there, and

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1 said, yes, isn't this kind of a reach not to have an  
2 ANPR? You're looking for a place for people to make  
3 comment.

4 And his opinion was that, in all the time  
5 he had been there, and they'd done quite a few of  
6 them, because that was in the earlier days, they  
7 really weren't of much use and they didn't promote the  
8 public comment, and certainly no more than you'd be  
9 able to get through the series of public meetings that  
10 are being proposed. So my own feeling is that it  
11 sounded funny at first, but it's probably quite  
12 reasonable.

13 MEMBER KIRCHNER: Well that's my sense. I  
14 wonder if it's really an issue.

15 MEMBER BLEY: I don't think it will be  
16 actually, but we won't know until the Commission  
17 issues their Staff Requirements Memorandum on that  
18 SECY.

19 VICE CHAIR REMPE: So typically this  
20 regulatory basis document would identify all the  
21 regulatory requirements and some background on it --

22 MEMBER BLEY: A lot of --

23 VICE CHAIR REMPE: -- in those documents?

24 MEMBER BLEY: If you look at some of the  
25 old ones, it really puts -- it's kind of there for a

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1 case where you're getting a new rule in an area where  
2 people aren't very familiar and it gives you all the  
3 background and what are the existing rules that might  
4 apply and what do you have to change?

5 If you do a new rule in the following way,  
6 and it lists what they're planning to do, then are  
7 there other regulations you have to change? So it  
8 really puts it in the context of the existing  
9 regulations.

10 MEMBER RICCARDELLA: Dennis, sometimes  
11 regulations come out and they have like a statement of  
12 considerations or something up front --

13 MEMBER BLEY: Hopefully they come out with  
14 a statement. It used to be a separate document. Now  
15 it seems to be embedded in the Federal Register Notice  
16 of the new rule.

17 MEMBER RICCARDELLA: Yes. And that's  
18 separate from the regulatory --

19 (Simultaneous speaking.)

20 MEMBER BLEY: -- up by the lawyers and  
21 approved by the Commission, and they give you more of  
22 the legal background and what's meant by things in the  
23 rule. So it kind of explains the rule a little bit,  
24 which seems a little odd, but that's the way it's been  
25 done forever. But go ahead, Pete.

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1                   MEMBER RICCARDELLA: Well I mean and that's  
2 separate from this regulatory basis? I mean it seems  
3 to me that covers a lot of the ground of the  
4 regulatory basis.

5                   MEMBER BLEY: It does, but it comes at the  
6 end, right, when the rule is issued --

7                   MEMBER RICCARDELLA: Yes.

8                   MEMBER BLEY: -- and just the things that  
9 still matter with respect to what's in the rule. The  
10 regulatory basis document comes first usually, and  
11 puts it in perspective of what's going to be there.

12                   MEMBER RICCARDELLA: I've just been through  
13 a similar rulemaking in the gas pipeline, they just  
14 came out with a new regulation. And they came out  
15 with a notice of, a NOPR, they called it, a notice of  
16 proposed regulation, and that included the statement  
17 of considerations, and that came out like two years  
18 before the actual regulation came out.

19                   MEMBER BLEY: Oh, well that's exactly true.  
20 An advance notice of public rulemaking comes out near  
21 the beginning, within the first year of the work  
22 that's going on.

23                   The thing about the basis document and the  
24 ANPR, and the ANPR, you're right, usually does include  
25 the other one, is it's an awful lot of work for the

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1 staff and takes a long time to get together and get  
2 approved. And they think they'll get as much  
3 information to the public more quickly by the path  
4 they're taking. And our meetings are part of that as  
5 well.

6 VICE CHAIR REMPE: So I agree with it, but  
7 I appreciate you talking about it, because I didn't  
8 fully understand what's being asked to be eliminated,  
9 so thank you.

10 MEMBER BLEY: I didn't either, I had to go  
11 look.

12 (Laughter.)

13 VICE CHAIR REMPE: Okay.

14 MR. WIDMAYER: So yes, Joy -- this is Derek  
15 -- normally, the regulatory basis document will have  
16 some proposed language in it or maybe some choices of  
17 proposed language. But the staff plans on doing this  
18 in a stepwise fashion, with multiple public meetings,  
19 to try to make progress that way instead of dumping it  
20 all into one document.

21 VICE CHAIR REMPE: At a high level, it kind  
22 of sounded like you're going to rely on the public for  
23 the basis and I just was like, this doesn't make  
24 sense, so I appreciate everyone talking about it a  
25 bit.

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1                   MEMBER BLEY: No, I think -- Derek, you can  
2                   comment on this too after I say it -- but I think the  
3                   staff sees the last five or more years of work on the  
4                   vision and strategy document and the implementation  
5                   plans, of which we've written four or five or six  
6                   letters, as fulfilling some of that information, and  
7                   includes language that they expect some of that will  
8                   make its way into the rule. Do you have any thoughts  
9                   on that?

10                   MR. WIDMAYER: I agree. And also we've had  
11                   some policy papers presented to the Committee also.  
12                   The ARDCs, the --

13                   MEMBER KIRCHNER: Functional containment?

14                   MR. WIDMAYER: Correct, yes, thank you,  
15                   Walt. And so they --

16                   MEMBER BLEY: Those were all draft SECYs  
17                   when they came to us, right?

18                   MR. WIDMAYER: Yes. And so they consider  
19                   a lot of that prior work to set the bases for some of  
20                   the things they want to propose.

21                   MEMBER BLEY: And they have received SRMs  
22                   on a number of those.

23                   MR. WIDMAYER: Yes, that's correct. And  
24                   not only that, but there's also a history, like you  
25                   said, that goes back 25 years, where they also have

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1 some positions they can play off of, as far as what  
2 Commissioners back then were thinking.

3 MEMBER BLEY: Well want to pursue that any  
4 more anybody? Well let me skim down that list.  
5 Derek, if you can put it up there, let's just go ahead  
6 to the first page and see if anything -- we had the  
7 scaling stuff, and I think that's more detail that we  
8 ought to do later.

9 I think we ought to keep this list. Well  
10 we'll keep our transcripts. And a number of these  
11 were answered today, the construction permits, early  
12 site permits. All the different forms of licensing in  
13 Part 50 and 52 they told us today will in fact be  
14 there and maybe additional ones.

15 Dose limits, we had a paper on dose limits  
16 that we wrote a response on, and I suspect that's --  
17 if you remember on citing in the paper that we  
18 reviewed, they were not proposing to change the  
19 regulation, but they were proposing to change the  
20 guidance on how you implement the regulation. And we  
21 supported them in that.

22 External hazards will certainly be there.  
23 I think as we go along, the idea of a simple rule, we  
24 can hit on that more and more, especially if we see it  
25 going the other direction.

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1           A number, or at least two people or three,  
2           have raised the idea that the approach in the LMP for  
3           selecting licensing basis events might be very  
4           complex. And I think that's one we ought to delve  
5           into with the staff as we go along.

6           I still think for many, it would be useful  
7           to go back to 1860 and read the two appendices that  
8           deal with that, they're very helpful. Mike Corradini  
9           raised this with me, we were going to have a  
10          discussion, we never got there, but it did send me  
11          back to reread those and they are helpful. I can tell  
12          you which appendices there are, if you want to go  
13          look, let me know.

14          The omissions are already in here, Walt,  
15          but I think we can pursue that as we go along.

16          My choice now, given the relative quiet,  
17          is -- oh, and I, in our list of stuff, I included Ed  
18          Lyman's comments, because they were from a different  
19          point of view and they're worth looking at. They put  
20          things together pretty well sometimes.

21          My proposal would be, unless anybody wants  
22          to dig into things more, to take a look at my proposed  
23          letter, let me read through it, and then come back and  
24          tell me whether it's close to what we want or if you  
25          want me to go do something a lot more or some of you

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1 want to take it over, which would be okay. What do  
2 you think?

3 CHAIR SUNSERI: Yes, I think that's a good  
4 idea, Dennis. I was going to -- I support you in  
5 that.

6 MEMBER BLEY: Derek, if you can put up the  
7 letter, and he told me everybody should have the new  
8 copy now, if you'd like to follow along.

9 MR. WIDMAYER: If it's all right with you,  
10 I'm going to rely on Sandra to put up the letter.

11 MEMBER BLEY: That's perfectly all right  
12 with me, that's even better if she's got it. Are you  
13 there, Sandra?

14 PARTICIPANT: Mr. Chairman and Member Bley,  
15 the court reporter has been continuing to do the  
16 transcription, and we're done with the major comments.  
17 Do you want the court reporter to continue as you go  
18 through the draft letter?

19 MEMBER BLEY: No, we're shifting to --

20 CHAIR SUNSERI: No.

21 MEMBER BLEY: -- letter writing now.

22 CHAIR SUNSERI: No, we're starting the  
23 letter; we can discontinue the transcript.

24 (Whereupon, the above-entitled matter went  
25 off the record at 5:22 p.m.)

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**HITACHI**

# ACRS Full Committee Presentation

GE-Hitachi (GEH)

Licensing Topical Report (LTR) NEDC-33910P  
BWRX-300 Reactor Pressure Vessel (RPV)  
Isolation and Overpressure Protection

September 10, 2020

ACRS Full Committee Presentation For GE Hitachi  
(GEH) BWRX-300 Licensing Topical Report (LTR)

NEDC-33910P Reactor Pressure Vessel (RPV)  
Isolation and Overpressure Protection

Open Session

# Agenda

BWRX-300 Design Overview

Licensing Topical Report Purpose and Scope

Technical Evaluation of RPV Isolation

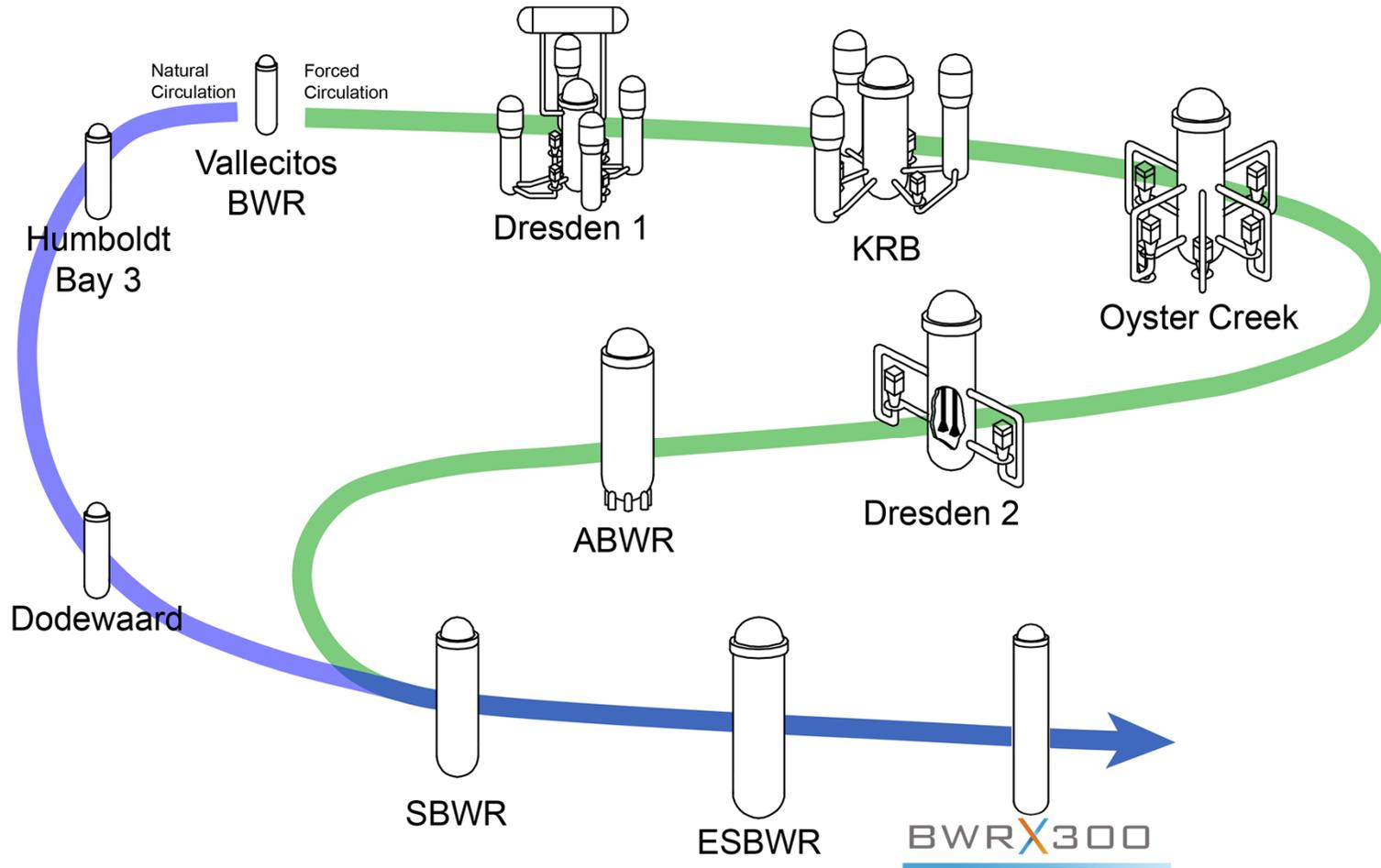
Technical Evaluation of RPV Overpressure Protection

Regulatory Evaluation

Closing Remarks and Questions

# BWRX-300 Design Overview

# Boiling Water Reactor Evolution



# Proven Reactor Technology

**BWRX300**

**Dryer:**

Same features as ABWR\* & ESBWR ...  
Same as upgrades for existing fleet ...  
Size nearly identical to KKM\*\*

**Steam Separators:**

Same as ABWR\* & ESBWR ...  
Similar to others in the BWR fleet

**GNF2 Fuel:**

18,500+ bundles delivered ...  
Utilized by ~70% of BWR fleet

**Control Rod Blades:**

Same as ABWR\* ...  
Longer than ESBWR ...  
Almost identical to latest design for BWR fleet

**Reactor Pressure Vessel:**

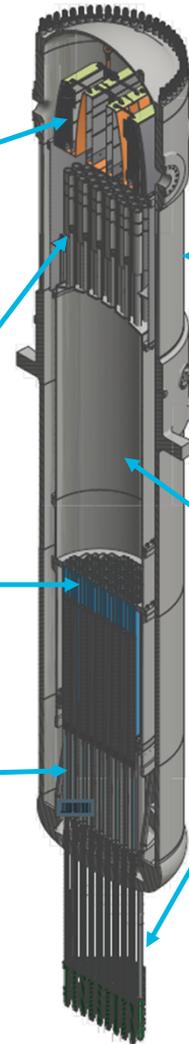
Same material and fabrication processes as  
ABWR\*, ESBWR and many of the BWR fleet ...  
Diameter almost identical to KKM\*\*

**Chimney:**

Uses ESBWR and Dodewaard\*\*\* technology ...  
Simplified

**Fine Motion Control Rod Drives:**

Same as ABWR\* & ESBWR



\* Advanced Boiling Water Reactor (ABWR) fleet has combined 22+ years of operating experience  
\*\* Kernkraftwerk Mühleberg (KKM): 355 MWe BWR/4 in operation since 1972  
\*\*\* Dodewaard: 58MWe natural circulation BWR, 1969 ~ 1997

# Licensing Topical Report Purpose and Scope

# Licensing Topical Report Purpose and Scope

Provide the design requirements, acceptance criteria, and regulatory basis for the BWRX-300 RPV isolation and overpressure protection design functions:

- BWRX-300 RPV isolation design functions
  - Specify design requirements for the RPV isolation valves and configuration with the function to close to limit the loss of coolant from large and medium pipe breaks
  - Specify design requirements for automatic actuation of the Isolation Condenser System (ICS) to remove decay heat from large, medium, and small pipe breaks
  - Specify BWRX-300 acceptance criteria in response to a LOCA that bound the acceptance criteria in 10 CFR 50.46(b)
  - Justify elimination of some design features previously used in BWRs (including ESBWR) in response to LOCAs
  - Describe compliance with the requirements of 10 CFR 50.46(b) and 10 CFR 50 Appendix A, General Design Criteria, GDC 1, GDC 2, GDC 4, GDC 14, GDC 30, GDC 31, GDC 33, GDC 35, and GDC 37

# Licensing Topical Report Purpose and Scope

Provide the design requirements, acceptance criteria, and regulatory basis for the BWRX-300 RPV isolation and overpressure protection design functions:

- BWRX-300 RPV overpressure protection design functions
  - Specify design requirements for overpressure protection for the reactor protection system (RPS) and ICS
  - Justify elimination of some design features previously used in BWRs including ESBWR in response to RPV overpressure events
  - Describe compliance with the requirements of 10 CFR 50 Appendix A, General Design Criteria, GDC 1, GDC 15, GDC 30, and GDC 31

# Technical Evaluation of RPV Isolation

# General Introduction

Approximately 300 MWe, water-cooled, natural circulation Small Modular Reactor (SMR) utilizing simple safety systems driven by natural phenomena

- Mitigation of LOCAs utilizes inherent margins to eliminate system challenges, including reduction of the number and size and position of RPV nozzles relative to top of active fuel (TAF)
  - Large RPV volume and tall chimney region provides substantial reservoir of water above the core
  - Reactor water level is maintained at or above TAF or fuel cladding temperature is maintained within normal operating temperature range following transients involving feedwater flow interruptions or LOCAs
  - RPV isolation valves are included in BWRX-300 design to limit the loss of coolant from large and medium pipe breaks
  - Heat from the reactor is rejected to the Isolation Condenser (IC) heat exchangers located within separate, large pools of water (the IC pools) outside the containment
  - The most likely sources of a loss of coolant for a Light-Water-Reactor (LWR) are eliminated by using BWRX-300 simple safety systems



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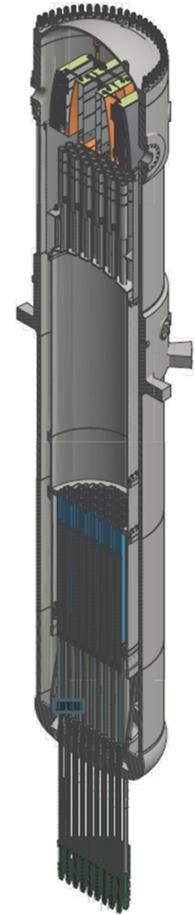
# BWRX-300 Reactor Pressure Vessel

The BWRX-300 RPV assembly consists of pressure vessel, removable head, and its appurtenances, supports and insulation, and reactor internals

Reactor vessel is relatively tall promoting natural circulation driving forces to produce abundant core coolant flow

An increased internal flow path length, relative to forced circulation BWRs, provided by a “chimney” in the space that extends from the top of the core to the entrance to the steam separator assembly

Chimney and steam separator assembly are supported by a shroud assembly that extends to the top of the core



Patents Pending

# BWRX-300 Isolation Condenser System (ICS)

The ICS passively removes heat from the reactor following these events

- Sudden reactor isolation at power operating conditions
- Station blackout (i.e., unavailability of all alternate current (AC) power)
- Anticipated Transient Without Scram (ATWS)
- LOCA

Initiated automatically on indications of an RPV overpressure event or on signals indicating a LOCA

IC pool installed capacity provides approximately seven days of reactor decay heat removal capability



# Overview of RPV Isolation Concept

BWRX-300 reactor incorporates RPV isolation that limits the loss of coolant from large and medium pipe breaks (LOCAs)

- Two RPV isolation valves in series, each independently able to isolate the line
- Automatic isolation function is single failure proof
- Valve bodies meet the requirements of ASME Boiler & Pressure Vessel (B&PV) Code Section III, Class 1

Design objectives of the BWRX-300 Reactor Coolant Pressure Boundary (RCPB) is to minimize the risks associated with LOCAs by the following

- Minimizing the number of nozzles, pipe lengths and nominal pipe diameters
- Maximizing the elevation of the nozzles above TAF
- Eliminating design features previously used in BWRs including ESBWR in response to LOCAs

# RPV and RPV Nozzle Design Requirements

BWRX-300 RPV and RPV nozzles designed using current versions of codes and standards with similar selection of design code accepted material specifications as ESBWR

- Piping and valves connected to nozzles shall be designed not to exceed allowable loads on any nozzle
- Feedwater inlet nozzles and IC condensate return nozzles shall be designed to account for stresses caused by cooler injection water
- Nozzles shall be low alloy steel forgings, except water level instrumentation nozzles
- Design of nozzles shall be in accordance with ASME Section III, Subsection NB and meet applicable requirements of vessel design documents
- Flanged connections that are part of RPV assembly are designed to ASME B&PV Code Section III, Subsection NB requirements

# RPV Isolation Valve and Actuator Design Requirements

- For piping connected to the RPV isolation valve assemblies extending to the containment wall, the BWRX-300 design requirements include identifying postulated pipe rupture locations and configurations inside containment as specified in BTP 3-4, Part B, Item 1(iii)(2), and identifying leakage cracks as specified in BTP 3-4, Part B, Item 1(v)(2)
- BWRX-300 RPV isolation valves shall have a proven low leakage potential
- RPV isolation valves for main steam line, feedwater, shutdown cooling, and reactor water cleanup shall fail in the closed position, with valve actuators designed to maintain the valves closed by positive mechanical means
  - Fail-close RPV isolation valves shall automatically close on high containment pressure indicating a LOCA
- RPV isolation valves and actuators shall be operable during events when containment pressure and temperature are elevated
- Control devices (e.g., pilots) that rely on electric power may be located outside the Primary Containment Vessel (PCV) when practical

# Large Pipe Break Design and Analysis Requirements

Largest steam line break is a main steam line break, largest liquid line break is the feedwater line break

- Large pipe breaks shall be isolated within a time frame which limits the peak pressure within the established containment design condition, and which ensures that the SSCs required to mitigate a LOCA shall be operable in the environmental conditions (PCV pressure, temperature, radiation, etc.) following a LOCA
- RPS performs the control of reactivity function by shutting down the core, and other SSCs comprising the Emergency Core Cooling System (ECCS) and Passive Containment Cooling System (PCCS) perform the fuel cooling and long-term heat removal functions by preserving core coolant and removing decay heat
- The RPV isolation valves and other SSCs comprising ECCS maintain reactor water level at or above TAF or fuel cladding temperature within normal operating temperature

# Small Pipe Break Design and Analysis Requirements

Small pipe breaks do not need to be isolated

- Mitigated by elevated placement of nozzles on the RPV assembly compared to TAF, and ECCS and PCCS which perform the fuel cooling and long-term heat removal functions by preserving core coolant and removing decay heat
- The ECCS maintains reactor water level at or above TAF or fuel cladding temperature within normal operating temperature

Small leaks in RCPB that do not exceed capability of the nonsafety-related high-pressure CRD system used as normal reactor coolant makeup during power operations are mitigated as any other small pipe break if normal reactor coolant makeup is lost

# LOCA Acceptance Criteria

BWRX-300 acceptance criteria in response to a LOCA are that the reactor water level is maintained at or above TAF or fuel cladding temperature is maintained within normal operating temperature range

Bounds the acceptance criteria of 10 CFR 50.46(b) by ensuring

- No significant fuel cladding heatup
- No significant fuel cladding oxidization
- No significant fuel cladding hydrogen generation
- No significant changes in core geometry
- Maintenance of long-term cooling to remove decay heat so that core temperature remains at acceptably low values

# Technical Evaluation of RPV Overpressure Protection

# RPV Overpressure Protection

BWRX-300 integrated overpressure protection during operation at power is ensured by application of the RPS to shut down the reactor in combination with heat removal SSCs that control RPV pressure

- Safety-related RPS assists in overpressure protection by initiating automatic reactor shutdown to prevent fuel damage, limit system pressure, and aid in containing radioactive materials
- Safety-related ICS assists in overpressure protection by removing decay heat passively with minimal loss of reactor coolant following reactor shutdown and isolation
- Overpressure protection for the RCPB complies with ASME B&PV Code, Section III, Article NB-7000

# Regulatory Evaluation

# Regulatory Evaluation

## 10 CFR 50 Regulations

- 10 CFR 50.34(f), Additional Three Mile Island (TMI) related requirements, where evaluated in the LTR are not technically relevant to the BWRX-300
- 10 CFR 50.46, Acceptance criteria for Emergency Core Cooling Systems (ECCS) for light-water nuclear power reactors
  - 10 CFR 50.46(a)(1)(i), 10 CFR 50.46(a)(1)(ii), and 10 CFR 50.46(a)(2), ECCS evaluation model for the BWRX-300, developed using previously approved ESBWR methodologies modified using BWRX-300 specific design requirements and parameters
    - Analyses will be completed during future licensing activities using an NRC-approved BWRX-300 ECCS evaluation model
    - Uncertainties will be addressed in the BWRX-300 ECCS evaluation model
    - BWRX-300 evaluation model will not use the alternatives provided in 10 CFR 50 Appendix K
  - 10 CFR 50.46(b)(1) through 10 CFR 50.46(b)(5) are met by the BWRX-300 acceptance criteria in response to a LOCA that the reactor water level is maintained at or above TAF or fuel cladding temperature is maintained within normal operating temperature range

# Regulatory Evaluation

## 10 CFR 50 Regulations (Continued)

- 10 CFR 50.46, Acceptance criteria for ECCS for light-water nuclear power reactors (continued)
  - 10 CFR 50.46(d), BWRX-300 complies with the criteria of paragraph (b), with cooling performance calculated with an acceptable evaluation model consistent with ECCS cooling performance design, especially Criterion 35 of Appendix A
- 10 CFR 50.55a, Codes and standards, and 10 CFR 50.55a(a), Documents approved for incorporation by reference
  - BWRX-300 RPV isolation valves and overpressure protection design features will be designed using the standards approved in 10 CFR 50.55a(a) in effect within six months of any license application
- 10 CFR 50 Appendix A, GDC 1, 2, 4, 14, 15, 30, 31, 33, 35, and 37
  - BWRX-300 RPV isolation valves and overpressure protection design features will comply with these requirements

# Regulatory Evaluation

## Evaluation of BWRX-300 Conformance to Regulatory Guidance

- Regulatory Guide (RG) 1.26, Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants
- RG 1.29, Seismic Design Classification
- RG 1.45, Guidance on Monitoring and Responding to RCS Leakage
- RG 1.84, Design, Fabrication, and Materials Code Case Acceptability, ASME Section III
- RG 1.147, Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1
- RG 1.192, Operation and Maintenance Code Case Acceptability, ASME OM Code

# Regulatory Evaluation

## Evaluation of BWRX-300 Conformance to Regulatory Guidance (Continued)

- Standard Review Plan (SRP) 3.9.6, Functional Design, Qualification, and Inservice Testing Programs for Pumps, Valves, and Dynamic Restraints
- SRP 5.2.2, Overpressure Protection
- SRP 5.4.13, Isolation Condenser System (BWR)
- SRP 6.3, ECCS
- SRP 15.6.5, LOCAs resulting from Spectrum of Postulated Piping Breaks Within the RCPB
- NUREG-0737, Clarification of TMI Action Plan Requirements, November 1980
- Generic Letter 83-02, NUREG-0737 Technical Specifications, dated January 10, 1983
- Generic Letter 95-07, Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves, dated August 17, 1995

# Closing Remarks and Questions



## ACRS Full Committee

### 10 CFR Part 53

# “Licensing and Regulation of Advanced Nuclear Reactors”

September 10, 2020

# Background

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- 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 (12/2016) 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

## 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.

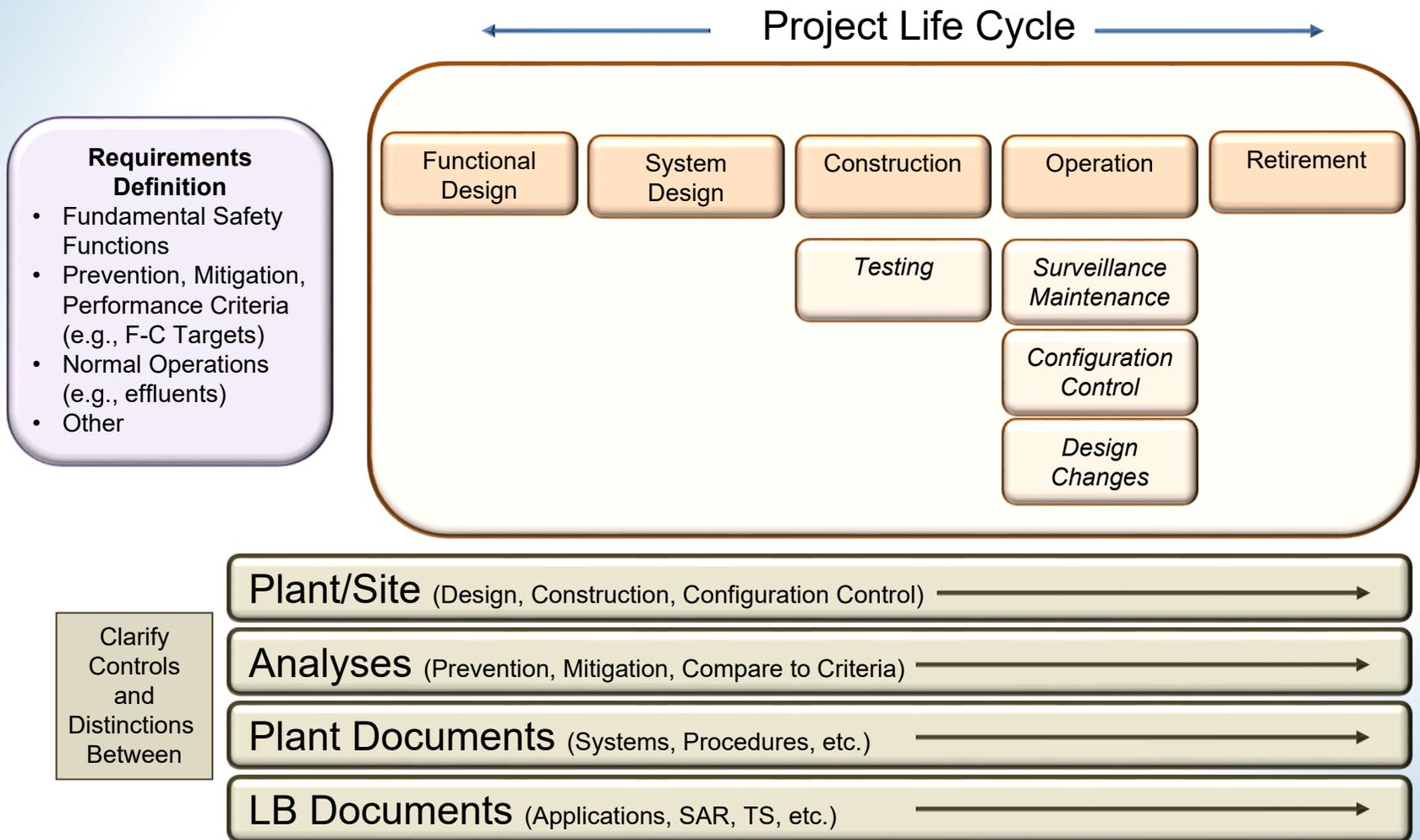
(14) **TECHNOLOGY-INCLUSIVE REGULATORY FRAMEWORK**—The term “technology-inclusive regulatory framework” means a regulatory framework developed using methods of evaluation that are flexible and practicable for application to a variety of reactor technologies, including, where appropriate, the use of risk-informed and performance-based techniques and other tools and methods.

## SECY-20-0032, Rulemaking Plan

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- 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.
- Awaiting Commission’s Staff Requirements Memorandum

# Technology Inclusive Regulatory Framework



## 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

# NRC Staff White Paper

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- 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.

## 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.

# Questions for Public Feedback

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1. Regulatory Objectives
  - Appropriate, understandable, achievable?
2. Scope and Types of Advanced Nuclear Reactors
  - Limit to advanced reactors as defined in NEIMA?
3. Technical Requirements versus Licensing Process
  - Limit to regulations related to technical standards?
  - Alternative licensing processes?
4. Performance Criteria
  - Technology-inclusive performance criteria?
5. Risk Metrics
  - Include risk metrics in the regulations?
6. Facility Life Cycle
  - How could new Part 53 align with facility life cycle
7. Definitions
  - Should Part 53 use existing definitions

# Questions for Public Feedback

---

8. Performance-Based Regulation
  - How to incorporate performance-based concepts?
9. Identifying Levels of Protection
  - Differentiate requirements for adequate protection and safety improvements?
10. Integrated Approach to Rulemaking
  - How to integrate safety, security, emergency preparedness?
11. Consistency with Historical Standards
  - Use of existing standards (e.g., safety goals)?
12. Quality Standards
  - Recognize alternatives to Appendix B?
13. Stakeholder Documents, Standards, Guidance
  - Stakeholder interest in preparing guidance?
14. Other Issues

# QUESTIONS?





# ACRS Meeting

## Topical Report Supplement to ANP-10337P-A for Deformable Grids

**Brian Painter**

September 10, 2020

# CONTENT

1. Review of Base Methodology
2. GAIA Fuel Assembly Design
3. Description of Deformable Grid Methodology

# Review of Base Methodology

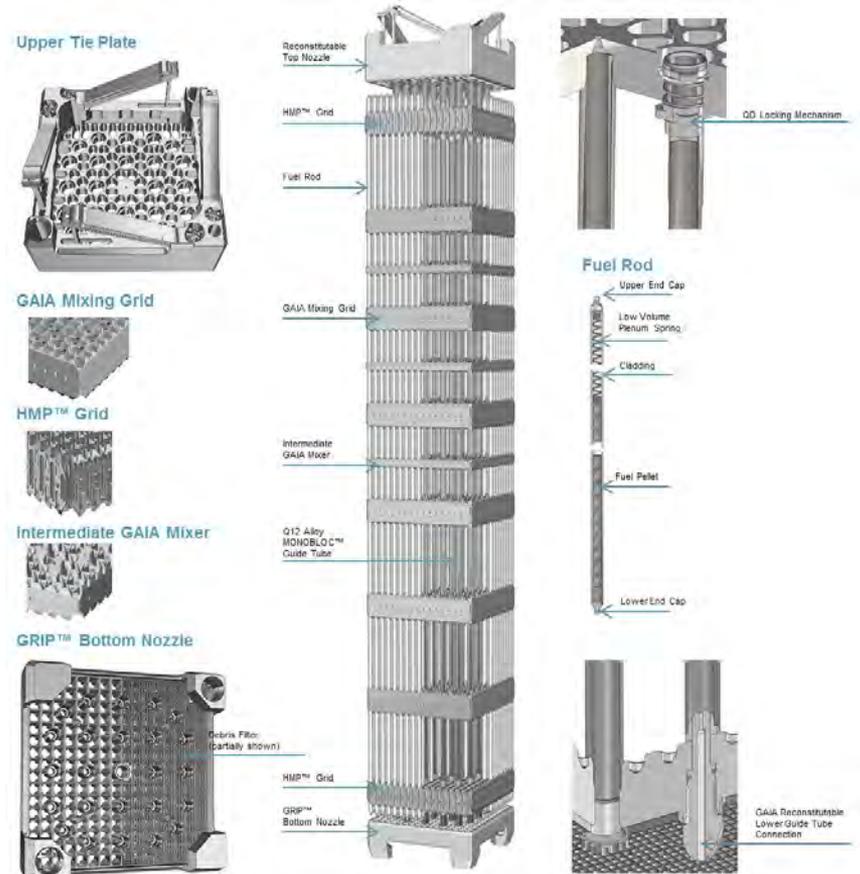
- Framatome's generic base methodology for PWR Seismic / LOCA mechanical evaluations, ANP-10337P-A, was approved in August 2018
- ANP-10337P-A:
  - Updates the lateral dynamic modeling, vertical dynamic modeling, and component stress analysis
  - Addresses NRC Information Notice 2012-09 "Irradiation Effects on Fuel Assembly Spacer Grid Crush Strength"
  - Defines spacer grid allowable impact load and allowable grid permanent deformations
- In the base methodology, the spacer grid impact response is assumed to be linear up to the allowable impact load
- New spacer grid designs, such as the GAIA design, exhibit a limited linear impact response followed by a nonlinear response
- The deformable spacer grid methodology is intended to extend the base methodology to address spacer grids with these nonlinear impact responses.

# Review of Base Methodology

- Most of the base topical remains applicable to the deformable grid supplement
  - Fuel assembly beam model architecture is unchanged
  - The applied damping and hydrodynamic coupling are unchanged
  - The treatment of irradiation effects on spacer grid testing is unchanged
  - Non-spacer grid component stress evaluation is unchanged
- The deformable grid supplement simply replaces the linear grid impact element with a nonlinear impact element

# GAIA Fuel Assembly

- The GAIA assembly is Framatome's latest 17x17 design for Westinghouse reactors
- The innovative GAIA spacer grid introduces a nonlinear response to external excitation
  - For moderate impacts, the grid remains linear
  - For larger impacts, the nonlinearities become important
- The grid linear elastic response was analyzed in the ANP-10342P-A sample problem using the generic ANP-10337P-A methodology



# Deformable Grid Methodology

- Supplement 1 to ANP-10337P-A implements a nonlinear, deformable spacer grid model to replace the linear visco-elastic spring prescribed in the base methodology
- The deformable grid element (DGE) can simulate the nonlinear impact response and predict residual spacer grid deformations due to seismic and LOCA events
- The inclusion of the DGE does not otherwise alter the modeling of the fuel assembly dynamic response
- The limiting impact load acceptance criteria from the base methodology are replaced with limiting residual deformations

# Acronyms

- ANCOVA – Analysis of Covariance
- BOL – Beginning of Life
- EOL – End of Life
- LOCA – Loss of Coolant Accident
- NRC – U.S. Nuclear Regulatory Commission
- SSE – Safe Shutdown Earthquake
- UCL – Upper Confidence Limit

# Trademarks

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Thank you

