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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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DIGITAL INSTRUMENTATION AND CONTROL SYSTEMS

SUBCOMMITTEE

+ + + + +

WEDNESDAY

SEPTEMBER 22, 2021

+ + + + +

The Subcommittee met via Teleconference,  
at 9:30 a.m. EDT, Charles Brown, Chair, presiding.

COMMITTEE MEMBERS:

CHARLES H. BROWN, JR., Chair

RONALD G. BALLINGER, Member

VICKI M. BIER, Member

VESNA B. DIMITRIJEVIC, Member

GREGORY H. HALNON, Member

JOSE MARCH-LEUBA, Member

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DESIGNATED FEDERAL OFFICIAL:

CHRISTINA ANTONESCU

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

9:33 a.m.

1  
2  
3 CHAIR BROWN: The meeting will now come to  
4 order.

5 This is a meeting of the Digital  
6 Instrumentation and Control Systems Subcommittee. I  
7 am Charles Brown, Chairman of this Subcommittee  
8 meeting.

9 ACRS members in attendance are Matt  
10 Sunseri, Jose March-Leuba, Vesna Dimitrijevic, Joy  
11 Rempe, Ron Ballinger, Dave Petti, Vicki Bier, and Greg  
12 Halnon.

13 Christina Antonescu of the ACRS staff is  
14 the Designated Federal Official for this meeting.

15 I presume the court reporter is available.

16 MS. ANTONESCU: Yes, the court reporter is  
17 available.

18 CHAIR BROWN: Okay. Thank you.

19 The purpose of this meeting is for the  
20 staff to brief the Subcommittee on the status of NRC  
21 Digital I&C activities.

22 The ACRS was established by statute and is  
23 governed by the Federal Advisory Committee Act, FACA.  
24 That means that the Committee can only speak through  
25 its published letter reports. We hold meetings to

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1 gather information to support our deliberations.

2 Interested parties who wish to provide  
3 comments can contact our office requesting time. That  
4 said, we set aside 10 minutes for comments from  
5 members of the public who are listening into our  
6 meetings. Written comments are also welcome.

7 The meeting agenda for today's meeting was  
8 published on the NRC's public meeting notice website,  
9 as well as the ACRS meeting website. On the agenda  
10 for this meeting and on the ACRS website are  
11 instructions as to how the public may participate. No  
12 requests for making a statement to the Subcommittee  
13 has been received from the public.

14 Due to COVID-19, we are conducting today's  
15 meeting virtually.

16 A transcript of the meeting is being kept  
17 and will be made available on our website. Therefore,  
18 we request that participants in this meeting should,  
19 first, identify themselves and speak with sufficient  
20 clarity and volume, so that they can be readily heard.

21 All presenters, please pause from time to  
22 time to allow members to ask questions. Please also  
23 indicate the slide number you are on when moving to  
24 the next slide.

25 We have the MS Teams phone line only-audio

1 established for the public to listen to the meeting.

2 Based on our experience from previous  
3 virtual meetings, I would like to remind the speakers  
4 and presenters to speak slowly.

5 We will take a short break after each  
6 presentation to allow time for screen-sharing as well  
7 as at the Chairman's discretion during longer  
8 presentations.

9 Lastly, please do not use any virtual  
10 meeting feature to conduct sidebar conversations or  
11 discussions. Rather, contact the DFO if you have  
12 technical questions, so we can bring those to the  
13 fore.

14 We will now proceed with the meeting, and  
15 I will, I guess, Mr. Marshall, Michael Marshall, to  
16 share his screen with us, which I see it. Does  
17 everybody else see the screen?

18 (No response.)

19 Hearing no negatives, I will ask Mr. Eric  
20 Benner, the Director of the Division of Engineering  
21 and External Hazards in the Office of Nuclear Reactor  
22 Regulation, for any introductory remarks to make  
23 before we begin today's presentations.

24 Eric?

25 MR. BENNER: Okay. Thank you, Member

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1 Brown.

2 Mike Marshall, can you go to the second  
3 slide?

4 So, as was alluded to, our purpose today  
5 is to brief this Subcommittee on the status of key  
6 digital I&C regulatory activities. I would say it  
7 even goes beyond key. I think we're covering most of  
8 the universe of what we're working on right now.

9 And part of the reason we are doing it  
10 this way is a lot of these different pieces of the  
11 regulatory infrastructure build upon one another. So,  
12 for the things that are more past tense, we're going  
13 to cover them pretty quickly, but they are some of the  
14 building blocks for things that have come after.

15 So, we have kept the presentation  
16 intentionally short. We think there will be plenty of  
17 time for questions and answers for the Committee.

18 We will, also, be covering the schedules  
19 for any of the ongoing and future activities. And we  
20 did not put detail in the slides on those, both from  
21 the standpoint of some of the things are longer-term  
22 and, thus, the schedules are more fluid. Some of the  
23 things are predicated on things outside of our  
24 control. For instance, for our licensing action  
25 discussion, we expect to get an application from

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1 Turkey Point by the end of this month. So, the  
2 discussion we'll have on the schedule, that review  
3 will be predicated on that assumption, but, obviously,  
4 we'll need to validate that assumption. And the hope  
5 with this discussion is both to give the ACRS an  
6 understanding of the entire landscape of work going  
7 on, and to help in the initial planning stages of when  
8 and where we'll be seeking ACRS involvement.

9 Next slide, please.

10 So, this is the agenda. Joining me today  
11 will be two of my direct-report Branch Chiefs, Jeanne  
12 Johnston and Mike Waters. Jeanne will be generally  
13 covering all of the guidance document updates. Mike  
14 Waters will be covering the licensing activities. And  
15 we also have a Senior Electronics Engineer, Rich  
16 Stattel, who I believe many of you are familiar with  
17 -- he's briefed the Committee a number of times before  
18 -- who will discuss Topical Reports, and then,  
19 obviously, closing comments. And like I said, I  
20 believe we have plenty of time to be able to dive into  
21 any questions or concerns the members have.

22 I'm pleased to know -- and this is an  
23 interesting outcome -- that we don't have a lot going  
24 on right now that would warrant ACRS review. And you  
25 might say, why am I pleased about that? Well, part of

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1 it is, by definition, the changes we've made under  
2 10 CFR 50.59 broaden what licensees can do without any  
3 NRC licensing involvement.

4 So, we're starting to collect data on how  
5 many 50.59s are being done for digital information.  
6 That data is still rough. So, I'm not going to bring  
7 it up here. But, as we collect that data, we'll share  
8 it with the Committee.

9 So, there are upgrades being done that we  
10 have no licensing involvement on. Now we do perform  
11 oversight of licensing 50.59s on a sample basis, and  
12 we also will start collecting feedback on any  
13 oversight performed of digital mods.

14 We have some limited data that shows that  
15 licensees have been using the guidance that's out  
16 there appropriately. So, we've had no concern. So,  
17 that's broadening the aperture for licensees to adopt  
18 new digital equipment. So, that's one of the reasons  
19 why I'm pleased.

20 Regarding infrastructure, this was a high  
21 focus of the Commission, as indicated in 2016, where  
22 we got guidance from the Commission to really come up  
23 with what was called the Integrated Action Plan. I  
24 will say that all of the activities on the Integrated  
25 Action Plan are now complete, except for NEI 17-06,

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1 which deals with commercial grade dedication, which we  
2 will be discussing today.

3 And in our interactions with the  
4 Commission, we all aligned that we are no longer  
5 updating the Integrated Action Plan, and any ongoing  
6 infrastructure upgrades are being managed through our  
7 routine processes. So, like the Reg Guide processes  
8 is what we're following now. There isn't a dedicated  
9 focus on digital I&C infrastructure.

10 Now, from an Integrated Action Plan  
11 standpoint, myself and Louise Lund, who is my  
12 counterpart in the Office of Research, we consider  
13 ourselves the accountable SES managers for all things  
14 digital I&C. So, we still maintain a focus, but,  
15 basically, the presentation you're going to get today  
16 really aligns with both the information that Louise  
17 and I get updated on on a fairly regular basis, and  
18 which we'll go into we still do an annual paper to the  
19 Commission. And that paper is due next month. And  
20 really, what you're getting today will be a preview of  
21 what's going to be in that paper next month.

22 So, really, our focus now is somewhat  
23 shifting to licensing actions, and I'm happy to report  
24 that we completed -- I'm taking a little of Mike's  
25 thunder -- that we've completed our first licensing

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1 action, Waterford, under the revised guidance. But  
2 we're starting to get plans for more.

3 I alluded to Turkey Point is supposed to  
4 be coming in at the end of the month. That's a large-  
5 scale upgrade to RPS and SFAS and some other systems.  
6 We are planning for, our schedule is planning for ACRS  
7 review for that. So, we'll be talking about that.

8 Limerick is supposed to be coming in next  
9 fall, and we're starting to get feedback from other  
10 licensees -- Dominion, in particular -- that they're  
11 starting to do the planning.

12 So, for this large-scale licensing  
13 actions, that will have a touch point with the  
14 Committee, and I think that will be where the rubber  
15 hits the road. So that, all this infrastructure has  
16 been great, but, as we get into the actual licensing  
17 reviews, that's where the staff has to make a  
18 regulatory decision that comports with the regulations  
19 and provides reasonable assurance of adequate  
20 protection. And we look forward to having the  
21 discussions with the Committees on those actual cases,  
22 to both demonstrate these upgrades are happening and  
23 they're going to be done in a manner that's safe.

24 So, I appreciate the opportunity to make  
25 these opening remarks. And with that, I will turn it

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1 over to Jeanne Johnston.

2 MS. JOHNSTON: Thank you, Eric.

3 CHAIR BROWN: Jeanne, can you excuse me  
4 for a second?

5 MS. JOHNSTON: Sure.

6 CHAIR BROWN: So that I can ask Eric a  
7 question.

8 MS. JOHNSTON: Okay.

9 CHAIR BROWN: Relative to you addressed  
10 Limerick and Turkey Point as being major upgrades,  
11 which we would, obviously, be involved in. But you,  
12 then, said that other stuff changes under 50.59, which  
13 I remember they had a lot of work on 50.59 --

14 MR. BENNER: Right.

15 CHAIR BROWN: -- and the appendix, and how  
16 they would be apprised. So, we're not disagreeing or  
17 arguing with that.

18 The one area I guess I'd like to have some  
19 clarification is there's a number of Reg Guides that  
20 apply to digital I&C, and things of that nature, that  
21 aren't plant upgrades, but are changes in terms of the  
22 regulatory guidance that's put out.

23 MR. BENNER: Yes, uh-hum.

24 CHAIR BROWN: We would expect to continue  
25 to see those that we desire to see --

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1 MR. BENNER: Yes.

2 CHAIR BROWN: -- under this, under your  
3 discussion. So, nothing's changed relative to that?

4 MR. BENNER: No, no. And I think, from a  
5 process standpoint, the Reg Guide process offers the  
6 opportunity for you to review all of them. I think  
7 Christine and I have talked a little about, you know,  
8 where we're getting the overt feedback from you that  
9 these in this technical arena are ones you're going to  
10 want to see. So, we have that information. I will  
11 work with my counterpart, Louise, who is the process  
12 owner for the Reg Guide process, to make sure that  
13 that interest by the Committee is locked in.

14 So, as we get down the path of entering  
15 the process for those documents, that your interest in  
16 reviewing them is noted, so it doesn't just get lost  
17 in the routine process where they're all offered to  
18 the Committee to see if the Committee has interest in  
19 reviewing.

20 CHAIR BROWN: You are aware that we do  
21 have a Commission briefing in October?

22 MR. BENNER: Uh-hum.

23 CHAIR BROWN: And the discussion of some  
24 of these, that type of an issue, is part of that  
25 discussion with the Commission. Just I presume you're

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1 aware of that?

2 MR. BENNER: Yes, we are. Thank you.

3 CHAIR BROWN: Okay.

4 MR. BENNER: Okay.

5 CHAIR BROWN: All right. I'll let you go  
6 on.

7 Any other comments from any other vendors  
8 before I mean, excuse me, members -- my old career is  
9 coming to the fore here -- before we proceed on with  
10 Jeanne?

11 (No response.)

12 Okay. Go ahead, Jeanne. Thank you very  
13 much for your patience.

14 MS. JOHNSTON: Okay. Thank you, Member  
15 Brown.

16 Good morning. My name is Jeanne Johnston,  
17 and I'm the Chief of the Long Term Operations and  
18 Modernization Branch.

19 For those of you who don't know, we  
20 reorganized last year into a three-Branch team  
21 covering electrical engineering and I&C licensing and  
22 guidance activities. So, my group has the  
23 programmatic responsibility to lead guidance  
24 development in I&C and special projects that support  
25 I&C modernization initiatives, which are necessary for

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1 the long-term operations of --

2 CHAIR BROWN: Jeanne?

3 MS. JOHNSTON: Yes?

4 CHAIR BROWN: You said, "electrical and  
5 I&C."

6 MS. JOHNSTON: That's correct.

7 CHAIR BROWN: So, you're tasked with the  
8 electrical as well?

9 MS. JOHNSTON: Yes, I have electrical  
10 engineers and I&C in my Branch, yes.

11 CHAIR BROWN: Okay. So, you cover that  
12 general category of stuff, such as Reg Guide 1.9 is a  
13 diesel generator, applications and stuff.

14 MS. JOHNSTON: Yes.

15 CHAIR BROWN: So, I would expect  
16 electrical stuff that's associated with a plant would  
17 come under your purview then?

18 MS. JOHNSTON: Yes, it does. We also have  
19 a separate Electrical Engineering Branch, which is not  
20 present today. Today's focus is on I&C.

21 CHAIR BROWN: Okay. That's fine.

22 MS. JOHNSTON: Okay. Yes, but we are, I  
23 was separating the Reg Guide 1.9, which you got a  
24 briefing on earlier this year, but we aren't going to  
25 be providing an update at this meeting --

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1 CHAIR BROWN: Okay.

2 MS. JOHNSTON: -- on that particular Reg  
3 Guide.

4 CHAIR BROWN: Okay. Thank you.

5 MS. JOHNSTON: Okay. So, today, first,  
6 I'm going to cover some major accomplishments that  
7 really lay the foundation and prepare the agency to be  
8 better able to support to increased licensing  
9 activities for the digital modernization.

10 Next slide.

11 As was mentioned previously in Eric's  
12 opening remarks, over recent years we have produced a  
13 number of key infrastructure updates to support and  
14 remove barriers for performing digital modifications  
15 under the 50.59 process. Most notably is the  
16 Supplement to a Regulatory Information Summary, the  
17 RIS, and the revised Reg Guide 1.187. Both of these  
18 products provide enhanced guidance for addressing  
19 software common cause failures when performing 50.59  
20 digital mods. And we believe that these products  
21 represent a big accomplishment, in that the staff has  
22 clarified how licensees can perform digital I&C  
23 modifications without NRC approval under the 50.59  
24 process.

25 CHAIR BROWN: Can I ask you a question?

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1 MS. JOHNSTON: Sure.

2 CHAIR BROWN: Back when we did the 50.59  
3 and the NEI 96-07, Reg Guide 1.187 was part of that  
4 process. My memory is that was Rev. 2.

5 MS. JOHNSTON: Yes.

6 CHAIR BROWN: And this slide indicates a  
7 Rev. 3. Has that been issued already?

8 MS. JOHNSTON: Yes. So, as you correctly  
9 recall, Revision 2 was issued in 2020, and we did  
10 issue it with an opportunity for post-promulgation  
11 comments. And due to the comments received, we made  
12 some minor changes and issued Revision 3 this year, in  
13 2021. So, Revision 3 is very similar to Revision 2.  
14 It just adds a few clarifications in response to post-  
15 promulgation comments. And they're very similar, but  
16 that's the difference between the revisions.

17 CHAIR BROWN: Got it. The reason I ask is  
18 I don't remember any inquiries as to whether we wanted  
19 to see Rev. 3 on that. So, I take it you never asked,  
20 is that correct?

21 MR. BENNER: No, my understanding is that  
22 Research's Reg Guide Branch did communicate that  
23 opportunity.

24 CHAIR BROWN: Okay. I'm saying my memory  
25 could be faulty.

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1 MR. BENNER: Yes.

2 CHAIR BROWN: Stuffing a lot of stuff in  
3 it.

4 MR. BENNER: But, like Jeanne said, it's  
5 a clarification, right. It really came up somewhat as  
6 a training issue, that there was a piece of the  
7 guidance that needed clarification. So, then,  
8 internally, we had a lot of discussion of, does there  
9 need to be an update at all? We felt it was prudent  
10 to provide the clarification. Basically, NEI revised  
11 their training materials to clarify the issue. We,  
12 essentially, took the language in their training  
13 materials and added that to the clarification. So, I  
14 would say it's not a substantive change. It was pure  
15 clarification.

16 CHAIR BROWN: Okay. Thank you.

17 MS. JOHNSTON: Okay. So, moving on, the  
18 guidance, key guidance documents have been updated,  
19 but we're ongoing in our efforts here to make sure  
20 that the agency implements the new guidance in a  
21 consistent fashion. So, we have supported regional  
22 inspector training on both of these documents over  
23 recent years.

24 And we are coordinating with our  
25 colleagues in the Regions who are performing

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1 inspections for digital modifications. And we were  
2 made aware of a desire for a tool that inspectors  
3 could use to help them when inspecting new digital  
4 systems. And so, we are in the process of putting  
5 together a proposed Digital Operating Experience Smart  
6 Sample document, which is an optional, voluntary tool  
7 to aid inspectors as they are reviewing new digital  
8 installations.

9 So, an OpE Smart Sample is a document that  
10 provides the inspection staff with a synopsis of  
11 relevant operating experience. And in this case, it  
12 would be related to digital I&C systems, and they  
13 could use this document as an additional tool to help  
14 them complete ROP baseline inspections. So, we are in  
15 the process of developing this, and we don't have too  
16 much further to share on that. But I'll pause here in  
17 case there are any questions on that.

18 CHAIR BROWN: Yes. It's me again, not on  
19 that.

20 While you were going through the RIS, I  
21 went back -- and to make sure you all understand, it  
22 was not impugning anybody's integrity, because I  
23 didn't intend that -- yes, I did review what you all  
24 proposed for Rev. 3 and agreed that we did not need to  
25 review it. So, the process is working fine from that

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1 standpoint.

2 MS. JOHNSTON: Okay. Fantastic.

3 CHAIR BROWN: I appreciate that. I didn't  
4 want you to think that I was walking away with the  
5 wrong impression, because I literally forgot it. So,  
6 I went and looked it up.

7 MS. JOHNSTON: Thank you. I think it just  
8 confirms that the changes between Rev. 2 and Rev. 3  
9 were relatively minor.

10 CHAIR BROWN: Yes, very much so. Very  
11 much so. Thank you.

12 MS. JOHNSTON: Okay. If there are no  
13 further questions on this, we can move to the next  
14 slide.

15 All right. For licensing process for  
16 digital modification, many of you know we've issued,  
17 in 2018, a revision to our ISG-06. And this defines  
18 what we call an alternate review process for digital  
19 I&C modifications that require NRC approval through  
20 the license amendment process.

21 And this ARP allows for an initial single  
22 phase of document submittals for review shortly after  
23 the high-level design has been firmed up and the  
24 detailed design is underway. And this is opposed to  
25 the previous version, which was Rev. 1, which defined

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1 a tiered approach, tiered submittals.

2 So, under the ARP, the staff can  
3 potentially make its licensing findings after detailed  
4 functional design had been completed, but before  
5 software validation and factory acceptance testing has  
6 been completed.

7 The ideal application of this process  
8 would somewhat abbreviate the licensing review for  
9 making a reasonable assurance finding, but would  
10 increase the emphasis on the oversight activities.  
11 So, such activities such as NRC inspections for  
12 ensuring that licensee has adequately adhered to its  
13 proposed design, and that the licensee's vendors and  
14 systems integration contractors have correctly  
15 implemented appropriate software and hardware  
16 integration validation and verification processes.

17 So, Rev. 2 was issued, like I said, in  
18 2018. And since then, we've had a number of  
19 stakeholder outreach activities, including a workshop  
20 earlier this year to discuss the application of ARP  
21 and clarify any questions from stakeholders.

22 And Mike Waters is going to cover this  
23 later in the presentation today, when he talks about  
24 the licensing activities in Waterford. But we first  
25 used this ARP process for the Waterford core

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1 protection calculator system replacement, and we're  
2 continuing to engage stakeholders on feedback and  
3 questions regarding the process. And we are planning  
4 to have another workshop this winter and continue to  
5 talk about lessons learned and collect some  
6 opportunities to potentially revise it in the future.  
7 But there are no current plans for Rev. 3 right now.  
8 We're still trying to get runtime with Rev. 2, and we  
9 expect to exercise the ARP with our future anticipated  
10 digital modification LARS that are coming in over the  
11 next year or so.

12 CHAIR BROWN: Okay. Can I clarify? I  
13 just want to make sure I understand that, with Rev. 2,  
14 with these two upcoming, the Turkey Point and  
15 Limerick, I would presume, based on your comments,  
16 that you all intend to use ISG-06 in what I call the  
17 free application part? Or that was where it was  
18 proposed initially to be used, if my memory serves me  
19 right.

20 MS. JOHNSTON: Yes. So, we are in pre-  
21 submittal engagements with Turkey Point and Limerick.  
22 And part of those discussions is clarifying  
23 application of this alternate review process. And  
24 there's the ideal process, and then, there's in  
25 practice, you know, applying it for a real-life,

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1 complex upgrade. And so, we are learning some things,  
2 and I think we're having really productive  
3 conversations in the pre-submittal engagements on  
4 applying this for a bigger-scale, more complex  
5 upgrade.

6 CHAIR BROWN: Okay. The reason I ask is  
7 that one of the critical parts of ISG-06 was the  
8 emphasis on the overall system architecture, which we  
9 have used extensively in the last three or four new  
10 design plant applications, DCDs and licensing actions.  
11 So, it's good to get that out on the table in front to  
12 make sure that, when they finally do come in, we are  
13 involved in, subsequently, in the review of a well-  
14 defined system architecture, similar to that we saw in  
15 NuScale and, say, the APR1400, is provided as part of  
16 that overall review process.

17 And that was to get that out on the table  
18 before. That's why we started that back in 2008 or  
19 2009, when we had difficulty with an earlier  
20 process/program at that time. So, I just wanted to  
21 make sure we hadn't lost the bubble.

22 MS. JOHNSTON: Okay. Certainly. And Mike  
23 Waters will definitely cover the anticipated Limerick  
24 and Turkey Point LARS later today.

25 CHAIR BROWN: Okay. Thank you very much,

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1 Jeanne.

2 MS. JOHNSTON: No problem.

3 We can go on to the next slide, if there  
4 are no further questions.

5 CHAIR BROWN: No, I'm done with that.

6 MS. JOHNSTON: Okay. Okay. So, this  
7 year, we updated an Inspection Procedure 52003 for  
8 digital I&C mods. And this Inspection Procedure  
9 supports all digital modification inspections,  
10 including those that are made under the ARP. This  
11 document was enhanced to include oversight of  
12 licensees' processes for conducting systems  
13 integration and their oversight throughout the  
14 hardware and software development life cycle. And  
15 additionally, our inspection criteria was enhanced to  
16 more clearly specify the goals of the inspection and  
17 to verify licensees' modification documentation and  
18 other relevant documentation, such as test results  
19 evaluation.

20 We're using this IP for the first time to  
21 support the Waterford core protection calculator  
22 system replacement inspections, and site acceptance  
23 tests for Waterford are anticipated to be conducted  
24 next month.

25 And we have received some preliminary

1 feedback from industry on this IP, and we're working  
2 with our external stakeholders to address this  
3 feedback, which will be done at a future public  
4 meeting. We don't currently have that scheduled yet,  
5 but we can keep you informed, if you are interested in  
6 those types of interactions.

7 Any questions on the Inspection Procedure?

8 (No response.)

9 Okay. Hearing none, I'll move on to the  
10 BTP. BTP-719, Revision 8, I'm sure the members are  
11 well aware that we issued this revision earlier this  
12 year. Overall, we believe that the new revision  
13 provides flexibility for new and innovative approaches  
14 to address common cause failure and using approaches  
15 such as defensive measures, but it also allows for  
16 flexibility for newer approaches to be considered by  
17 the staff on a case-by-case basis.

18 And the ACRS, when we previously came to  
19 ACRS for review of this product, we were made aware of  
20 some concerns regarding the need to enforce the use of  
21 unidirectional, hardware-based data communications,  
22 when those communications occur from high safety  
23 significant systems to a system of lower safety  
24 significance.

25 And the Chairman tasked the EDO to set up

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1 an independent staff team. And that independent staff  
2 review team, at the direction of the EDO, performed a  
3 review. Ultimately, the outcome was a recommendation  
4 to update certain key guidance documents, including  
5 the BTP, to raise awareness that unidirectional  
6 communications is one available option for system  
7 designers. And we are planning on revising the BTP to  
8 address that direction from the EDO to include that  
9 enhanced clarification and to add in our lessons  
10 learned from applying the BTP for upcoming licensing  
11 actions.

12 So, we are planning to update the BTP.  
13 However, the timeline for doing that is kind off to  
14 the future. So, we are not going to be coming back to  
15 ACRS on the BTP anytime soon. We are going to be  
16 applying the BTP for the Turkey Point and Limerick  
17 applications and collecting lessons learned. And  
18 Revision 9 will be a wholesale revision to incorporate  
19 the current feedback that we have and new feedback  
20 that we're going to collect.

21 CHAIR BROWN: You're aware that's an  
22 issue?

23 MS. JOHNSTON: Yes.

24 CHAIR BROWN: And you're aware that  
25 earlier comments were, it sounds like you won't even

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1 be addressing the unidirectional issue on these  
2 because it's not in the BTP? So, it just hangs out  
3 there waiting to be; sooner or later, we're going to  
4 look at these things. I'm just making sure it's clear  
5 that, when these projects come forth, I can virtually  
6 guarantee there will be significant discussion as to  
7 how the communications are done, just as occurred on  
8 APR1400 and NuScale.

9 MR. BENNER: And I would say there's two  
10 points to that, Member Brown. The first point is for  
11 the operating reactors. As part of the implementation  
12 of the cyber security requirements, they all  
13 implemented the data diode so it exists.

14 So, certainly for any operating reactor  
15 LARS that come forth, the fact that they've  
16 implemented that is something we're aware of, and, you  
17 know, we'll factor into the review as appropriate.

18 The letter, the recommendations from the  
19 independent review team and the EDO's memo to the  
20 Chairman drew a conclusion that there was no safety  
21 issue identified and no regulatory gap in that this is  
22 still seen as a cyber issue, and it's addressed as  
23 part of the cyber program requirements.

24 Now, for the operating reactors, like I  
25 said, they all have their existing cyber program, so,

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1 which includes the data diodes. So that information  
2 exists. So, for these reviews, I think we're all  
3 going to end up in a, in exactly the same place.

4 I think where you've rightly pointed out  
5 is there may still be some disconnect on what will  
6 happen in design certification space. So the  
7 recommendations have us revise the BTP, Reg Guide  
8 1.53, and NSIR Revised Reg Guide 5.71 to raise  
9 awareness of this for design cert applicants.

10 But there still will not be any sort of  
11 regulatory finding in this regard at the design cert  
12 stage because that continues to be addressed in the  
13 operational cyber security program review that happens  
14 at the COL or operating license stage under Part 50.

15 So I understand that there still may be  
16 some concern in that regard. But that's what the team  
17 found and that's what the EDO -- the EDO tasked us to  
18 make revisions that are in alignment with what the  
19 team found.

20 CHAIR BROWN: Well, one of the aspects of  
21 that is you're doing a reactor protection system and  
22 safeguards upgrades, whatever they consist of, which  
23 involves a whole new architecture of replacement of  
24 analog equipment with digital equipment. So the  
25 digital, the data diodes that had been implemented had

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1       been implemented in the framework of an architecture  
2       that is analog, not digital.

3               So there are other aspects of applying a  
4       digital architecture other than and over and above  
5       what has already been accomplished in the past. I  
6       recognize what operating plants have done up to this  
7       point via the previous orders and the Reg Guide 5.71  
8       implementation in operating plants.

9               So there's a difference right now if you  
10       don't -- you've got to look at the new architecture  
11       and say does it still, is the existing design and  
12       setup satisfactory for what we're receiving or has it  
13       --

14               MR. BENNER: Yes.

15               CHAIR BROWN: -- been compromised in some  
16       other way. For example --

17               MR. BENNER: Yes, yes.

18               CHAIR BROWN: -- the new systems in the  
19       operating plant, the fundamental point of cyber  
20       doesn't even deal with the protection systems per se.  
21       You can't change those functions.

22               It's for the overall plant. Any  
23       information going out goes through a data diode. And  
24       it's protected from external connection for other  
25       aspects of the plant, not the protection system.

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1           So I guess I would disagree that there's  
2 not a safety issue, because right now the application  
3 of the digital systems is not addressed at all.

4           MR. BENNER:   And I will say that our  
5 review will continue to look at all hazards of what is  
6 inside the data diode to look at where there are  
7 potentially bidirectional communications.

8           I will say even on the, you know, the  
9 APR1400 there, you know, within that boundary, there  
10 are some bidirectional communications.   And we  
11 understand there are potential hazards associated with  
12 that.

13           And ultimately, we had what we felt were  
14 the right constraints in place to manage the hazards  
15 of those bidirectional communications and made the  
16 licensing decision on, or the certification decision  
17 on that.

18           CHAIR BROWN:  If you note from my review,  
19 we did not -- the reason we were not dealing with a  
20 rule change per se, a rule change is like taking a  
21 hammer, you know, to swat a gnat in some -- that's not  
22 a good analogy.

23           But there is no argument that there are  
24 some areas, but not in the protection safeguards or  
25 what I call safety-related control systems, where you

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1 do not want to have bidirectional communications into  
2 those systems. And now they're internal.

3 So you have to look at those individually  
4 within the plant, not just -- which is what we did on  
5 the design certifications. The data going out of the  
6 critical safety systems was unidirectional. It was a  
7 hardware data diode, as well as the communication from  
8 a network out to the rest of the world. And those  
9 were data diodes.

10 So I'm saying right now you've got data  
11 diodes going out to the rest of the world. But the  
12 internal plant stuff, when you do a new digital  
13 systems for protection and safeguards, or any other  
14 system, even a reactor, you know, reactivity control  
15 system upgrade, you certainly do not want that. And  
16 it will be digital. If they upgrade it, it's just the  
17 way it's going to happen.

18 MR. BENNER: Yes.

19 CHAIR BROWN: You don't want that  
20 communicating bidirectionally with the outside world  
21 or even an internal network that's connected to the  
22 outside world.

23 MR. BENNER: Yes. And I --

24 CHAIR BROWN: That --

25 MR. BENNER: -- I think in a number of

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1 those cases we have had other mechanisms that have --  
2 if there is an area where bidirectional communication  
3 that we feel the hazards are not able to be managed,  
4 we have limited it to unidirectional communication --

5 CHAIR BROWN: Okay --

6 MR. BENNER: -- but not necessarily a data  
7 diode.

8 CHAIR BROWN: Well, if it's a software-  
9 based unidirectional, then it's just as susceptible as  
10 a bidirectional.

11 MR. BENNER: Okay. I will have to get  
12 into those on the individual reviews.

13 CHAIR BROWN: No, exactly. That's my  
14 point. With the argument --

15 MR. BENNER: Yeah.

16 CHAIR BROWN: -- that there's not a safety  
17 gap, oddly there still is. If I was asked in a public  
18 session, I would say that.

19 So I don't tend to not agree. I don't  
20 totally disagree, because there obviously have been  
21 some corrective actions or there is things done to  
22 address that. But it's not -- our approach has been  
23 more all-encompassing as opposed to applying it to  
24 just new design certifications.

25 So I've got a little bit of concern with

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1 the delay. The defense-in-depth is a very, very  
2 critical section of this. And the application of any  
3 digital systems are -- the architectures, the main  
4 thing, the problem is when you do introduce  
5 vulnerabilities both in, you know, the how do you make  
6 sure you've got good high-quality software.

7 And the second is how do you make sure  
8 nobody can access it and change it in a detrimental  
9 manner. That control of access is a major  
10 vulnerability that we have grave concerns on as we  
11 stated.

12 So I guess this is going to be subject for  
13 more discussion. But I just wanted to make sure I  
14 made those points. And I understand yours. And --

15 MR. BENNER: We do understand your views.  
16 And I think at, you know, at bottom, we're aligned on  
17 the underlying concerns and try to manage those  
18 concerns. And I think it will need to -- we'll, you  
19 know, we'll hopefully, as we work through this, you  
20 know, case by case, we'll refine them.

21 Those are some of the lessons learned  
22 we've talked about that, you know, ultimately would be  
23 factored into both our guidance and our engagement  
24 with any of the standards organizations.

25 CHAIR BROWN: But right now it's not in

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1       BTP 7-19, because it is a defense-in-depth issue. And  
2       it's not covered in 1.152, which is the application of  
3       computers and I think, and safety systems. I've  
4       forgotten the whole title.

5               But, anyway, that is a -- I learned a  
6       lesson back in my old naval nuclear days is -- and  
7       Rickover used to rip your head off. Don't tell me how  
8       you're doing everything just right. Where is it  
9       documented? And where do you have the guidance for  
10      people to know what they should be looking at?

11             And if you didn't, couldn't come back and  
12      say we're fixing that spec or that regulation or that  
13      design document, you didn't get very far without  
14      having your tail on fire. So, and the other four-  
15      stars were no more happy than he was.

16             So the point here is to make sure those  
17      things are on the table and that they are considered  
18      as part of the defense-in-depth. And it's not there  
19      right now. And waiting five years to put it in seems  
20      to me, in my own mind, with other potential upgrades  
21      coming in, that's where it's critical now.

22             It's the internal application from high  
23      safety to low safety or non-safety systems that you  
24      have to be careful internal of the plant, even though  
25      you've take care of the data diode on the internal to

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1 external in the operating plants, depending on where  
2 the data goes.

3 MR. BENNER: And understood. And I will  
4 say from, you know, the tasking we had focused on  
5 raising awareness for applicants. So I'm going to  
6 steal a little of Jeanne's thunder, that we are  
7 intending to have a subsequent workshop on licensing  
8 lessons learned. And so we're going to commit to  
9 overtly discuss that independent review team and the  
10 tasking.

11 So, even in advance of us making the  
12 changes to the guidance, we're going to discuss that  
13 topic with the stakeholders who would be coming in,  
14 both new reactor and operating reactor, to make them  
15 aware, and again, you know, make them aware of the  
16 concern and how it, you know, needs to be addressed.

17 So, again, you know, some of this is just  
18 going to play out in the individual reviews as we do  
19 them.

20 MEMBER MARCH-LEUBA: Charlie, can I add  
21 something to your position?

22 CHAIR BROWN: Sure, yeah, sure thing,  
23 Jose. Go on.

24 MEMBER MARCH-LEUBA: This is Jose.

25 CHAIR BROWN: Yeah, go on.

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1 MEMBER MARCH-LEUBA: Yeah, let me get at  
2 it from a different point of view. Almost a couple  
3 weeks ago reviewing a bulletin issued by NIST. NIST  
4 keeps a database of vulnerabilities. The number was  
5 2021-14444.

6 A couple weeks ago, NIST identified 40,000  
7 vulnerabilities this year. That's 200 vulnerabilities  
8 a day. Of course, this is for everything in the  
9 world, Windows, Mac, embedded system, microwaves, but  
10 still 200 vulnerabilities a day.

11 And these aren't the ones from the good  
12 hackers. Those are the ones that get reported,  
13 correct? There are innumerable number of  
14 vulnerabilities that are kept secret, especially by  
15 state actors.

16 If you do a search on NIST on VPN  
17 vulnerabilities, which is how all these communications  
18 are established, on average you get a vulnerability on  
19 a VPN system discovered once every three days. Okay.

20 Any licensee that comes and tells you we  
21 have a software driven firewall that cannot be  
22 penetrated, you should just laugh in their face.  
23 That's insane. And it's completely indefensible in  
24 view of these statistics.

25 So, whenever you review these things and

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1 you say that it's not a safety system, they're going  
2 to tell you how a VPN is a very strong connection,  
3 everything is encrypted. And you say, yeah, how long  
4 is it going to be until a North Korean hacker breaks  
5 into it. I guess --

6 MR. BENNER: But this is --

7 MEMBER MARCH-LEUBA: I want to thoroughly  
8 support Charlie's position. And my statement is  
9 anybody that tells you that you can protect an  
10 internet connected software device, you should laugh  
11 in their face. It's indefensible. Okay. That's it.

12 MR. BENNER: Yeah, but I think we keep  
13 crossing these issues of the barrier to the outside  
14 world and then communications within different  
15 echelons within that barrier.

16 So I don't want to say anything more about  
17 that, because I don't think any of us saying that a  
18 VPN is the right barrier from a cyber protection  
19 standpoint. So --

20 CHAIR BROWN: Let me make one observation  
21 to you, Eric, relative to Jose's comment. I  
22 understand the connection to the outside world, as  
23 Jose was addressing.

24 But when you get down to it, say you've  
25 got an internal reactor protection system. It's

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1 software based. But you need to make software  
2 upgrades.

3 And sometimes you will find errors, not  
4 common cause failure, nothing like that, just in the  
5 process of operating -- that doesn't look right. Why  
6 did that happen? And the vendor goes back and says,  
7 oh, we've got a little software glitch. We can fix  
8 that with a software modification.

9 Now the question comes up is, how do you  
10 do that. Well, people have commented, oh, that's  
11 easy. We'll transmit it to you, to your facility via  
12 the internet. And you can then download it. Okay.

13 Or we can send it directly via a one-time  
14 only connection as being implemented or espoused  
15 potentially in the Rev. 5.71, a one-time only  
16 permission granted to let the internet connect to the  
17 internal plant and download that software into your,  
18 whatever the system is, reactivity control, reactor  
19 protection, safe -- whatever it is. That is the type  
20 of thought process that can kill you -- you just don't  
21 want to have that.

22 The other way is to put it, fine, now I'm  
23 not going to do that. I'm going to bring it in on a  
24 CD, which I will put onto a laptop. And I can plug it  
25 into, you know, the equipment and download it.

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1 Well, what's the vulnerability there? Now  
2 your laptop should not have anything else on it ever,  
3 because it may have been connected to the internet at  
4 some point. You have -- it becomes a piece of  
5 critical test equipment like your high calibration  
6 voltmeters, ammeters, frequency generators,  
7 oscilloscope, whatever it is you use to calibrate  
8 analog stuff with.

9 It is now your prime instrumentation. And  
10 you can't have any other application code. And you  
11 can't ever let it be downloaded. The only way you can  
12 protect yourself somewhat is a DVD with no other  
13 information. Okay.

14 So there's a lot of things to think about  
15 in this, in that once you bring something into the  
16 plant, it's not just that.

17 And we noted that in the letter. It was  
18 high to low safety significance. The lower safety  
19 significance would be the laptop, or it could be a  
20 maintenance cabinet that's built in the designs, which  
21 some of the new design applications have. How do you  
22 get the upgrade into that before you put your cable in  
23 to connect it to the system?

24 That's why this unidirectional thought  
25 process cannot be just covered, quote, because there

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1 is no cyber security system within the systems in the  
2 plant. You can't have them.

3 Nobody in their right mind would put a  
4 cyber security virus protection software into a  
5 reactivity control or a reaction protection system.  
6 You can't predict its performance under those  
7 circumstance.

8 So you're vulnerable because it is  
9 literally sterile equipment relative to cyber. You  
10 can only protect it by not allowing access or very,  
11 very strongly controlled access.

12 We need to move on. I just -- but it's  
13 been a good discussion --

14 MR. BENNER: And it is. And I think  
15 because it is, it treads both on cyber, which, you  
16 know, there are programmatic requirements there. But,  
17 Member Brown, as you point out, there's stuff inside  
18 that really isn't cyber. And that is more the purview  
19 of the secured development operating environment.

20 And, you know, I will say these concerns  
21 about, yes, someone brings a laptop in, someone brings  
22 a thumb drive in, you know, that there are controls  
23 that licensees have to put in place to control how  
24 that happens.

25 And like you've alluded to, you know, some

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1 of this is dedicated maintenance workstations where we  
2 have the controls there for that piece of it. So,  
3 again, you're right. I don't want to belabor the  
4 point. I think we share some, you know, similar  
5 beliefs as to how, that this does need to be  
6 controlled.

7 And, you know, like I said, where it will  
8 play out is in the individual licensing reviews. And,  
9 you know, ultimately we will update the guidance to  
10 reflect that.

11 MEMBER REMPE: So this is Joy. And I  
12 appreciate what you're saying about the need to move  
13 on.

14 But, Eric, wouldn't it, in light of the  
15 spirit of trying to be an effective, Be RiskSMART  
16 regulator, wouldn't it be more effective to just  
17 update it sooner than later considering what the  
18 process is you're envisioning versus what it could be?

19 MR. BENNER: If I had infinite resources,  
20 I would love to.

21 MEMBER REMPE: Okay.

22 MR. BENNER: I don't. And I now have  
23 licensing work that is essentially going to consume  
24 many of my resources.

25 Now, the update to Reg -- I'm getting

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1 ahead of myself, and Jeanne was going to get here.  
2 The update to Reg Guide 1.153 was already scheduled.  
3 That's a fairly heavy lift because of the detail, or  
4 I should say Reg Guide 1.152 for IEEE 7432.

5 That's a pretty detailed standard. The  
6 standard is out there. And the NRC participated in  
7 the working group that developed that standard.

8 So, you know, the fact that licensees are  
9 likely going to use that standard, even in advance of  
10 us doing the formal endorsement of that standard, that  
11 information is out there.

12 So infrastructure ends up taking a  
13 backseat to actual licensing and oversight work. And  
14 the IAP was focused on the near-term, key  
15 infrastructure updates that needed to be done.

16 And as I alluded to, most of those are  
17 done. And the remaining infrastructure updates are on  
18 a schedule that aligns with the fact that they are  
19 more routine updates and that the priority of those is  
20 lower than the incoming licensing work.

21 And that's just my reality of I have a  
22 limited number of resources to do all these things  
23 people would like me to do. And I do want to make  
24 sure that I have the right people and the right number  
25 of people on something like Turkey Point so we do a

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1 robust technical review.

2 I will reiterate that, in advance of us  
3 doing guidance documents, we continue to have  
4 workshops to communicate with licensees who are  
5 considering doing these upgrades so they're aware of  
6 lessons learned both from previous reviews and the  
7 reviews we're going to do now.

8 And that, I mean, that's where we're at  
9 from a balancing, you know, workload with priorities  
10 standpoint.

11 MEMBER REMPE: Okay. Thank you.

12 CHAIR BROWN: We will go ahead. And I  
13 agree with Joy by the way. We had the opportunity to  
14 get it into 7-19, and it didn't get in. That's  
15 fundamentally why we ended up where we are today as  
16 you're aware. Can anybody hear me, or am I dead?

17 MS. JOHNSTON: No, we can hear you --

18 CHAIR BROWN: Oh, okay. I thought --  
19 everything, nothing was moving on my screen, which is  
20 very unusual. Okay. Jeanne, this will be open for  
21 more discussion or more opportunities for discussion,  
22 let's put it that way.

23 MS. JOHNSTON: Okay.

24 CHAIR BROWN: We do have 5.71 coming up,  
25 Eric. So you can imagine that's going to be a robust

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1 meeting to say the least.

2 MS. JOHNSTON: Understood. If there are  
3 no further questions on this slide, I think we can  
4 move on.

5 CHAIR BROWN: Oh, absolutely. Get moving.

6 MS. JOHNSTON: Okay. All right.

7 CHAIR BROWN: Sorry about that.

8 MS. JOHNSTON: Okay. So we're not done  
9 with common cause failure yet. We are still  
10 continuing our work to address common cause failure.

11 Over the past year, we have been engaging  
12 with NEI and presubmittal activities to discuss  
13 proposed guidance and what they call NEI 20-07 for  
14 addressing software common cause failure in high  
15 safety-significant safety-related digital I&C systems.

16 We are expecting a new draft version of  
17 this guidance to be submitted at the end of this  
18 month, so at the end of September. And the new  
19 version is going to supersede previous drafts that  
20 we've been reviewing. And it's going to, it's  
21 expected to adopt a risk-informed approach.

22 And we have not received the new draft D  
23 yet. But we are anticipating a need to evaluate if  
24 our current common cause failure policy, which is in  
25 the SRM to SECY 93-087, if that needs to be updated

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1 before a potential endorsement of 20-07 could occur.

2 So we don't have the official submittal in  
3 house yet. So we don't have a lot of the details.  
4 But we have been having pre-submittal discussions.  
5 And the last public meeting was July 1 of this year.

6 CHAIR BROWN: We will be interested in  
7 seeing this obviously.

8 MS. JOHNSTON: Okay. Any other questions  
9 on 20-07?

10 CHAIR BROWN: Was I clear? You said --

11 MS. JOHNSTON: Yes, yeah, yeah, we got the  
12 message. You want to see this. And we are still, you  
13 know, doing the, you know, the review. We haven't  
14 even started the real technical review yet. We're  
15 still in pre-submittal space right now.

16 But when we do get to the point of  
17 potentially endorsing it, if it is acceptable, a  
18 regulatory guide might be the vehicle that we choose.  
19 And you will absolutely be made aware of opportunities  
20 to review that later down the road.

21 CHAIR BROWN: Is this the first, is this  
22 Rev. 0 of 07 by the way?

23 MS. JOHNSTON: So we're in draft. We're  
24 in draft space.

25 CHAIR BROWN: But this is new.

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1 MS. JOHNSTON: Yeah, this is new.

2 CHAIR BROWN: The RIS, didn't RISs cover  
3 this before? Didn't we have some RIS that covered  
4 common cause failure clarifications on how to -- blah,  
5 blah. I can't remember --

6 MS. JOHNSTON: Yeah.

7 CHAIR BROWN: -- all the RISs that I've  
8 seen.

9 MS. JOHNSTON: Yes, we did supplement.  
10 One was a RIS for focusing on 50.59 modifications. So  
11 --

12 MR. BENNER: And that was for low safety  
13 significance issues.

14 CHAIR BROWN: Yeah, that's right. I  
15 remember now. Thank you for helping me with that.  
16 It's been a while. Okay. Go on, Jeanne. I'm,  
17 Jeanne, I'm --

18 MS. JOHNSTON: Yeah, so these would be the  
19 high safety-significant systems that would go hand in  
20 hand with a license amendment.

21 CHAIR BROWN: Okay. Thank you.

22 MS. JOHNSTON: So the new approach would  
23 be an alternate method, which is currently allowed by  
24 BTP 7-19. So we are just standing by to evaluate any  
25 potential policy changes that may be necessary to

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1 support a formal endorsement of this guidance.

2 CHAIR BROWN: Okay.

3 MS. JOHNSTON: Okay?

4 CHAIR BROWN: Yep.

5 MS. JOHNSTON: If no further questions, we  
6 can move on.

7 CHAIR BROWN: Yes, go ahead.

8 MS. JOHNSTON: Okay. We are also  
9 continuing work on NEI 17-06, which would be a  
10 potential reg guide if we find this guidance from NEI  
11 acceptable for a commercial grade dedication of  
12 digital equipment.

13 And NEI 17-06 provides guidance on  
14 procuring and accepting commercial grade digital  
15 equipment for nuclear safety-related applications when  
16 that equipment has received a Safety Integrity Level,  
17 or SIL, certification in compliance with an IEC  
18 Standard 61508, functional safety for  
19 electrical/electronic safety-related systems.

20 So, according to this guidance, the  
21 dedicating entities could rely on the SIL  
22 certification process in lieu of conducting a  
23 commercial grade survey to provide reasonable  
24 assurance that dependability, critical characteristics  
25 are adequately controlled.

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1           And we are in the process of reviewing  
2 this new guidance. It was submitted in February. And  
3 if we find it acceptable, we will start the regulatory  
4 guide process at the end of this year.

5           So, according to the reg guide process,  
6 the ACRS would be notified of an opportunity to  
7 review. And I think the soonest would be middle of  
8 next year, maybe in April or May, depending on when we  
9 can start the comments, the public comment process.

10           CHAIR BROWN: We would probably pretty  
11 much want to see this as a first of a kind. It also  
12 addresses a critical issue for the -- typically, this  
13 commercial grade dedication means the computer  
14 function like the platform, like Common Q for instance  
15 I guess.

16           And when your commercial systems, they try  
17 to sell those to a lot of different people. And they  
18 have lots of functions in them. So there's lots of  
19 opportunities for vulnerabilities to exist in the  
20 hacker world. So that really needs to be thoughtfully  
21 done.

22           I'm just bringing that up because it's  
23 something you all need to do, because the vendors, you  
24 don't have custom software. It's, they're using other  
25 people's operating systems. Understand that, that

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1 that makes it even more important to pay attention.  
2 So you can go on.

3 MEMBER HALNON: Hey, Charlie, this is  
4 Greg, real quick. Did you say this is just software,  
5 or is it hardware as well --

6 CHAIR BROWN: No, it's hardware as well.  
7 It's a combination. They build a platform. It's got  
8 all the computing capability.  
9 But they've got an operating system embedded in it.

10 MEMBER HALNON: Okay. Is counterfeit  
11 issue involved with this at all?

12 CHAIR BROWN: Yes and no. I mean,  
13 somebody could -- once something's out and they know  
14 it's good, it could be counterfeited I guess. I mean  
15 --

16 MEMBER HALNON: So I guess back to Jeanne.  
17 Is that part of this, is to protect us against  
18 counterfeit, the counterfeit issue that we had a  
19 couple, three years ago?

20 MS. JOHNSTON: I'm going to call on my  
21 staff lead, Dinesh Taneja. If he could -- if he's on  
22 the line, if he could step in to address that  
23 question.

24 MR. TANEJA: Yes, hello. This is Dinesh  
25 Taneja. The SIL certification process -- so right

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1 now, the way we do commercial rededication of digital  
2 equipment is the dedicating entities use the EPRI  
3 TR-106439 guidance, which we endorsed back in 1990.  
4 So part of that review -- the supply chain is looked  
5 at by the dedicating entities of a manufacturer's  
6 product. And IEC 61-508 also goes and does a deep  
7 dive into looking at what the supply chain was and how  
8 that was controlled in the equipment development.

9 So the difference is that the IEC 61-508  
10 certification is done to equipment that is uniquely  
11 designed for safety-critical applications -- not just  
12 for -- it's not specific to nuclear industry. It is  
13 designed for pharmaceuticals, petrochemicals, and  
14 everywhere else. So it is -- cyber is a big concern  
15 and I believe that is evaluated as part of that SIL  
16 certification process.

17 MEMBER HALNON: Okay. So there is -- I'm  
18 sorry, what you're saying -- it's already in the  
19 process. It's nothing new in the 1706, then?

20 MR. TANEJA: No -- no, nothing new.

21 MEMBER HALNON: Okay, thank you. You can  
22 go ahead, Charlie. Appreciate it.

23 CHAIR BROWN: Okay, thank you Greg. Go  
24 ahead Jeanne.

25 MS. JOHNSTON: Okay, we can go to the next

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1 slide. Okay, so -- so the NRC did endorse an EPRI  
2 technical report guideline on evaluating -- evaluation  
3 acceptance of commercial-graded digital equipment in  
4 1997. And the proposed Reg Guide -- if any I-1706 is  
5 found acceptable -- would really complete the story  
6 and provide durable guidance.

7 (Simultaneous speaking.)

8 MS. JOHNSTON: Somebody is not on mute. So  
9 we are continuing to engage with NEI to validate the  
10 process by which the third-party certification becomes  
11 accredited. And there is also an existing reg guide  
12 -- Reg Guide 1.164 -- that's also going to be  
13 referenced in the new reg guide. And it's where --  
14 we're hoping that the -- the new reg guide would, you  
15 know, provide a wholesome landscape that kind of ties  
16 the whole story together. And the -- like, I think I  
17 mentioned it previously -- we're expecting, if it  
18 stays on track, the public comment period to occur in  
19 May of next year. And if ACRS would like a briefing  
20 for that before the public comment period, that would  
21 be April time frame. And so we can certainly work  
22 with your staff to arrange for that.

23 CHAIR BROWN: Okay, thank you.

24 MS. JOHNSTON: Okay. We can go on to slide  
25 11. We -- now I am going to talk about reg guides.

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1 So we do -- we are continuing to strategically update  
2 other infrastructure, mainly key regulatory guides, to  
3 improve the clarity and cohesiveness of the guidance.  
4 And we plan on doing this by endorsing more recent,  
5 more relevant, code and consensus standards. And --  
6 and by updating certain reg guides and consolidating  
7 them to allow for more effective navigation and use of  
8 the available guidance.

9 So the -- the two reg guide activities  
10 that are currently on the horizon are Reg Guide 1.152  
11 -- this is the guide that endorses IEEE 7432. And the  
12 proposed revision would endorse the latest revision --  
13 or the 2016 version of that standard. And it would --  
14 we're also planning to incorporate new guidance to  
15 address some of the things we were talking about  
16 previously with the Secure Development and Operational  
17 Environment, SDOE. And --

18 (Simultaneous speaking.)

19 CHAIR BROWN: My suggestion -- real quick.  
20 The SDOE -- people keep talking -- but that's largely  
21 a vendor. Secure Development Operation Environment --  
22 that's not an in-plant type thing, from all the  
23 previous discussions I remember from years ago. Am I  
24 out to lunch on that? Or what? That's when vendors  
25 are buying something that you guys certify that the

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1 applicant has selected a vendor that has a secure  
2 development operating environment for developing of  
3 software. Carefully crafted comments are made. It's  
4 logged in and all that kind of stuff. Am I correct in  
5 that?

6 MS. JOHNSTON: I think -- I think -- I  
7 think it's -- it covers both of those aspects.

8 CHAIR BROWN: How does -- how does the  
9 applicant -- how does the plant itself get involved in  
10 that? I -- I'm a little surprised at the -- you --  
11 the applicants would have a large software development  
12 staff for most of these systems. Greg, am I out to  
13 lunch on that? Can --

14 MEMBER HALNON: It's growing, Charlie. You  
15 know, the more -- we get more digital in the industry,  
16 I think the -- the staff is growing and -- and -- as  
17 the -- the politically incorrect way is the older guys  
18 are -- older and more experienced people are moving  
19 on. The younger folks coming in have a different  
20 skill set. And I think that -- I think it's growing.  
21 So I -- I'm not sure if it's to the extent of what  
22 you're saying, but there is quite a bit of -- for  
23 instance, it used to be that PRA staff was one or two  
24 people. Now there's whole departments. So it's --  
25 it's growing.

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1 CHAIR BROWN: Yes, I could see that idea.  
2 So I'm -- I'm just remembering back about -- I don't  
3 know, eight or nine -- ten years ago when we were  
4 doing this we talked about the Secure Development  
5 Operating Environment. It was largely vendor for NRC  
6 to -- to make sure that the applicant had selected --  
7 but I understand your point about, as the world  
8 changes, I -- obviously the licensees are going to  
9 have to change also for certain types of things.

10 MEMBER HALNON: Right, the cyber ruling  
11 itself put full departments in play at many utilities.

12 CHAIR BROWN: Yes, okay.

13 MS. JOHNSTON: So -- but reg guide 1.152  
14 covers both the vendor development and the licensee's  
15 operational environment -- when it's installed and how  
16 it's connected at the site.

17 (Simultaneous speaking.)

18 CHAIR BROWN: Okay.

19 MS. JOHNSTON: And going back -- you know,  
20 there are safety and security interface issues that we  
21 are aware of. We're continuing to collaborate and  
22 team up with our colleagues in NSIR. My understanding  
23 is that the counterfeit issues of -- those are part of  
24 a supply chain, risk management -- that's addressed as  
25 part of the cyber security aspect. And our safety

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1 review would focus on the secure development and --  
2 operational environment. And we are going to address  
3 the feedback that was given as part of BTP 7-19 and  
4 the inter-directional communication in this next  
5 revision. So we will address the clarification. It  
6 will -- you know, it is guidance. It falls short of  
7 being a requirement. But it is -- the clarification  
8 is intended to raise awareness of one approach that is  
9 available to an --

10 (Simultaneous speaking.)

11 CHAIR BROWN: In your process of doing  
12 that, it ought to -- it -- while it -- a reg guide  
13 never makes anything a requirement. It's always  
14 guidance.

15 MS. JOHNSTON: Yes.

16 CHAIR BROWN: We understand that. But the  
17 words make a difference -- in the reg guides, and-or  
18 the BTP, as they -- as we used in the design review  
19 guide, the -- the non-light water reactor. Which is  
20 really applicable to everybody. Words not as an  
21 option, it should be the words like, preferred. It --  
22 the -- the NRC ought to make it clear that the  
23 preferred way is -- as stated in part -- in parts of  
24 5.71, high safety to low safety should be uni-  
25 directional. It should be hardware. It's right in

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1 7.5 -- 5.71. So it just needs to be emphasized  
2 because people lose sight of that. They don't look at  
3 5.71 until, you know, equipment is delivered five, ten  
4 years later. So it's part of the -- part of the  
5 design ought to be, you know -- that's where you  
6 should be using that thought process as well. That's  
7 what we're trying to get to.

8 (Simultaneous speaking.)

9 MS. JOHNSTON: Okay --

10 CHAIR BROWN: The words make -- the words  
11 make a difference.

12 MS. JOHNSTON: Understood. And we -- we  
13 will take that into consideration. Also, we'll  
14 continue to work with our colleagues in NSIR. As you  
15 know, reg guide 571 is also -- it's in the process of  
16 being updated. And the -- the workshops that we're  
17 planning on having with our stakeholders is another  
18 opportunity to raise awareness that system designers  
19 and vendors should be thinking about cyber security.  
20 And they should be thinking about these things --

21 (Simultaneous speaking.)

22 CHAIR BROWN: It's not -- let me -- let me  
23 help you. It's not cyber security. It's control of  
24 access.

25 MS. JOHNSTON: Control of access.

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1 CHAIR BROWN: It's control of access. Of  
2 course, there is no cyber security functions inside of  
3 all of these systems. The protection systems  
4 safeguards one control -- or reactivity control.  
5 Starting -- even the controllers -- computer-based  
6 controllers starting in the operating plants, starting  
7 safeguards pumps through operating valves if they  
8 change those out. I don't know why they would, but  
9 maybe they -- maybe they do. That is -- that's the  
10 point of the whole thing -- is control of access. In  
11 the analogue world there was no access. Digital world  
12 -- there's infinite access if you're not careful. So  
13 it's control of access because there -- you can't put  
14 cyber security software into a -- a safeguards pump  
15 control unit and all of the sudden have it not open  
16 when you're supposed to.

17 MS. JOHNSTON: Understood.

18 CHAIR BROWN: Or you can't update it all  
19 the time. You can't have access coming from the  
20 outside world, or even from the inside world. You  
21 never know how malware is going to get in there.  
22 Anyway, okay -- I've preached enough on that. You --  
23 it's control of access. That's the point.

24 (Simultaneous speaking.)

25 MS. JOHNSTON: Okay -- message -- message

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1 received.

2 CHAIR BROWN: It's not cyber security.  
3 We've tried to say that over and over again. People  
4 keep --

5 MS. JOHNSTON: Okay.

6 CHAIR BROWN: -- they haven't been  
7 listening. No, I take that back. They've been  
8 listening. We're not communicating.

9 (Laughter.)

10 MS. JOHNSTON: Okay, so I think we -- we  
11 covered that topic sufficiently. So -- so the --  
12 going to status for this reg guide update, as you can  
13 see there's a lot of technical objectives that we wish  
14 to accomplish in the next revision. And we -- we  
15 don't have infinite staff resources here. So the --  
16 the current plan is to work on this draft guide and  
17 provide a -- you know, really initiate the reg guide  
18 process next year, in 2022. And then that would put  
19 the comment period and potential ACRS review in the  
20 2023 time frame. And we will certainly keep you  
21 engaged of what the schedule turns out to be and --  
22 and provide it for opportunity for review.

23 CHAIR BROWN: Yes, I'd like to do this  
24 before I die.

25 MS. JOHNSTON: Well --

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1 (Laughter.)

2 CHAIR BROWN: That's just a little humor.

3 (Laughter.)

4 CHAIR BROWN: -- humor, okay.

5 (Simultaneous speaking.)

6 MS. JOHNSTON: Stay healthy.

7 CHAIR BROWN: I'm working on that. Go  
8 ahead.

9 MS. JOHNSTON: Flu season is coming up.

10 CHAIR BROWN: Yes.

11 MS. JOHNSTON: Okay, so the other reg  
12 guide, which is I would say behind Reg Guide 1.152 as  
13 far as schedule goes, is Reg Guide 1.168 for software  
14 verification validation. So we are considering  
15 adopting a graded approach alternatives towards  
16 specified software integrity level guidance. This is  
17 different than the previous SIL which is safety  
18 integrity level for 1706. This is different -- same  
19 acronym, different meaning. Not to confuse anybody.

20 But this reg guide endorses an IEEE  
21 standard 10-12. And we would be potentially endorsing  
22 the 2016 version of this standard. And it's a -- it  
23 would also be a change in how we're endorsing this  
24 standard. Because currently we -- we have everything  
25 -- sorry, I'm just gathering my notes. Current -- the

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1 current guidance endorses and approach to assign all  
2 safety systems the highest SIL level, which is SIL 4,  
3 and the proposed -- what we're proposing is to see if  
4 we could assess -- if we could apply a graded approach  
5 for the software integrity levels. So -- so not  
6 everything would necessarily be a software SIL 4 and  
7 that we could -- licensees could take advantage of the  
8 different gradation of V&V activities. We are also --

9 (Simultaneous speaking.)

10 CHAIR BROWN: Let me -- go ahead.

11 MS. JOHNSTON: Okay.

12 CHAIR BROWN: No, go ahead. No, let's --

13 MS. JOHNSTON: Okay, we're also considering  
14 the feasibility of consolidating other software  
15 criteria that reside in other reg guides. And I have  
16 those listed here. And that's really in an effort to  
17 simplify what can be perceived as a really complicated  
18 and, you know, not clear regulatory guide structure if  
19 applicants and vendors have to go to several different  
20 places to get the guidance that they need. So we're  
21 -- we're considering in this next revision to also  
22 consolidate the guidance that exists in other  
23 software-related reg guides.

24 CHAIR BROWN: Observation is that I guess  
25 the graded approach would then be available for the

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1 software development for safety systems, like reactor  
2 protection, reactor trip safeguard systems?

3 MS. JOHNSTON: Yes.

4 CHAIR BROWN: The -- I'll just give you an  
5 observation. One -- in the -- we still had a  
6 requirement or problem even with the safety -- the  
7 high safety level. I mean, the possibility of data  
8 corruption -- getting out and then locking up  
9 processors -- is lowered if you have a much higher  
10 level integrity software system -- evaluation system,  
11 or integrity level. But once you start reducing it  
12 to, well, we won't be quite as rigorous. That just  
13 increases the chance that the programmers who love to  
14 program, or you'll have more potential for corruption  
15 of data. And corrupt data has the strong potential  
16 for locking up processors, which increases the  
17 importance of the watchdog timers that are put on the  
18 processors in these systems. So it's -- if they lock  
19 up, they trip, particularly in the safety -- in the  
20 reactor protection system you trip, and in the  
21 safeguards you provide an alarm. Because a single  
22 channel within a redundant system can then lock up  
23 every voting unit. I'm just saying that there's a  
24 combination of things here. We had arguments about --  
25 if I go back ten years, one of the hard -- one of the

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1 watch dog timers was actually a software-based timer  
2 on the platform itself. And that was ridiculous. It  
3 had to be an independent hardware base with its own  
4 power supply -- watchdog timer. So I'm -- I'm just --  
5 something you need to consider when you go to a graded  
6 approach -- how does that affect the basic design?  
7 The architecture of the systems? And that ought to be  
8 talked about if you're going to go to this graded  
9 approach.

10 It increases the level of attention over  
11 and above what -- even I would think, okay, in terms  
12 of the basic architecture. Because that's where your  
13 basic safety is and the redundancy and independence --  
14 deterministic in the defense and depth and diversity  
15 aspects. And control of access. Just makes that more  
16 important. That's just a thought -- something you got  
17 to keep in mind because, when we see this, we will be  
18 -- at least if I'm still here -- or, still alive -- we  
19 will be addressing that thought when we go through  
20 this as to how you address that in this -- in this  
21 update.

22 MS. JOHNSTON: Okay, understood. Thank you  
23 for that feedback.

24 CHAIR BROWN: Just a comment, okay? All  
25 right, go on to the next slide.

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1 MS. JOHNSTON: Okay, so -- I just wanted to  
2 quickly cover here before we move on --

3 CHAIR BROWN: Okay.

4 MS. JOHNSTON: Previously we did have Reg  
5 Guide 1.153 on the schedule. We were on the  
6 subcommittee's calendar for October. But we've since  
7 then had to withdraw from that meeting because we are  
8 reevaluating whether or not the -- a regulatory guide  
9 is the best vehicle or approach that -- just wanted to  
10 address that in case there are any questions for why  
11 that kind of dropped off of the -- the horizon as far  
12 as reg guide updates goes. So the Reg Guide 1.153  
13 endorses IEEE 603, which is -- the 1991 version is  
14 incorporated by reference in our requirements and we  
15 had intended on updating that to endorse the 2018  
16 version of 603. But right now we -- we're heading  
17 back to the drawing board on that and we're evaluating  
18 the path forward for that so we don't have very much  
19 at this meeting to share with you.

20 CHAIR BROWN: Okay, let me ask a question.  
21 Back several years ago there was a proposed rule  
22 change to 10 CFR 50.55-A-H.

23 MS. JOHNSTON: Yes.

24 CHAIR BROWN: I think if 603-1991 is  
25 invoked in the rule --

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1 MS. JOHNSTON: Yes.

2 CHAIR BROWN: -- if my -- if my memory is  
3 correct. And so changing 1.15 -- 1.53 -- I -- one  
4 time I looked at one of the -- a variation between  
5 1991 whenever we tried to do a -- and the commission  
6 rejected the change to the rule to update 1 -- the --  
7 to provide clarifications for 1991 version of 603 in  
8 the rule. And now 1.153 -- if you go to a 2018  
9 version, I remember looking at an earlier revision of  
10 that and there were -- we lost something. 1991 was  
11 actually better than the more current revision.

12 MS. JOHNSTON: Right. I think what you  
13 were maybe referring to is the 2009 version of IEEE  
14 603?

15 CHAIR BROWN: Yes.

16 MS. JOHNSTON: Okay, so there were a number  
17 of conditions and issues that came up with that  
18 previous rulemaking, as you recall correctly, and the  
19 staff -- we worked with the industry to resolve those  
20 issues, both -- and the resolution resides in the 2018  
21 version of 603 and 7432, which is in a different reg  
22 guide -- is Reg Guide --

23 (Simultaneous speaking.)

24 CHAIR BROWN: But 7432 does not really say  
25 the same things that 603 does. It covers the areas --

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1 MS. JOHNSTON: Yes.

2 CHAIR BROWN: They're complimentary in some  
3 respects.

4 MS. JOHNSTON: Right.

5 CHAIR BROWN: The point is because 2008 --  
6 we -- it was so -- there was enough problems and  
7 differences between the 1991 version that we had a  
8 whole bunch of clarifications and exceptions that we  
9 were going to invoke to part of the rule. And I guess  
10 the commission decided, no, we're not going to do  
11 that.

12 MS. JOHNSTON: Right.

13 CHAIR BROWN: And you all took that on  
14 board and you're saying all the issues to try to  
15 resolve that -- those problems hopefully are now in  
16 the IEEE 2018 version of 603?

17 MS. JOHNSTON: Yes, that's -- that's  
18 correct.

19 CHAIR BROWN: Okay.

20 MS. JOHNSTON: I believe the -- the outcome  
21 of that -- of those differences that came to light  
22 during the previous rulemaking we -- were addressed  
23 during the subsequent IEEE Consensus Standard. And  
24 there -- an update of that standard. And that's in  
25 the 2018 version. So the -- we want to -- you know,

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1 that's the -- that's the version that -- that we  
2 participated in and that -- you know, resolves many of  
3 the -- the past issues that you're alluding to in the  
4 previous rulemaking.

5 CHAIR BROWN: Okay.

6 MS. JOHNSTON: So -- I have to provide some  
7 clarification.

8 (Simultaneous speaking.)

9 CHAIR BROWN: No, no -- that's -- that was  
10 actually -- I'm glad you did that, thank you.

11 MS. JOHNSTON: Okay. All right, and just  
12 wanted to clarify, it's -- the 2018 version doesn't  
13 fully -- doesn't address everything. Some of the  
14 other resolutions reside in -- elsewhere. Like the --  
15 the other IEEE standard, 7432. So it's a combination  
16 of those two standards where the -- the whole picture  
17 resolves, is --

18 (Simultaneous speaking.)

19 CHAIR BROWN: Okay. Obviously we will want  
20 to be involved in that.

21 MS. JOHNSTON: Yes, understood. Yes. And  
22 like I said, we are kind of back to the drawing board  
23 is where we're -- we are reevaluating if our reg guide  
24 is really the -- the right vehicle to do what we want  
25 to do as far as encouraging --

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1 (Simultaneous speaking.)

2 CHAIR BROWN: As opposed to -- as opposed  
3 to a rule change?

4 MS. JOHNSTON: Right.

5 CHAIR BROWN: Rule changes are tough.

6 (Simultaneous speaking.)

7 MS. JOHNSTON: Yes, I know. Yes, I may not  
8 be alive for a -- for a rule change. But it -- we are  
9 -- you know, we are reevaluating what options we have  
10 available and what -- also considering the resources  
11 and competing priorities that -- that are in front of  
12 us -- what we want to focus on over the next few  
13 years, so --

14 CHAIR BROWN: Okay. Well the -- that's a  
15 key -- key point because 603-1991, the control of  
16 access is -- back in those days, was analogue -- it  
17 was largely physical control. Who you let in and who  
18 you didn't let in. Who you allowed to touch it, who  
19 you didn't. Now that's a different world with the  
20 digital stuff. So -- all right, I'll let you go on to  
21 your next slide. I appreciate your -- going through  
22 that.

23 MS. JOHNSTON: No problem, thank you. Next  
24 slide, please. Okay, and finally we are participating  
25 in a -- a wholesale modernization effort of the

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1 standard review plan. The -- it's not just Chapter 7  
2 that's being modernized. The -- the Agency is  
3 modernizing every chapter of the Standard Review Plan.  
4 But we -- we really took this opportunity to look at  
5 the current Chapter 7 and how it's organized and came  
6 up with a plan to -- to consolidate some of the -- the  
7 guidance and move from a system-specific structure,  
8 which is the current state, to potentially a safety-  
9 focus and requirement-centered review guidance. And  
10 so what the current guidance looks like if you -- if  
11 you look at the -- the different subchapters, or  
12 subsections of -- in Chapter 7 is -- there's a lot of  
13 system-specific sections and the -- explain to a  
14 reviewer the regulatory requirements and -- and set  
15 them through on a system-specific basis. And what  
16 we're proposing in the new structure is to change it  
17 up to be more focused on safety and the regulatory  
18 requirements. So we would be going from eight  
19 sections to five sections. Also consolidating  
20 information -- extraneous information that's in the  
21 appendices right now. We would be relocating those to  
22 the section -- the regulatory requirement sections and  
23 identifying -- right now we have 17 separate BTPs. We  
24 would be eliminating 13 of those BTPs. But not -- not  
25 completely the information in them. We would just be

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1 moving some of the system-specific content and  
2 transfer those to a different document such as an I&C  
3 system review guide. Because it is -- it is good  
4 information to retain and to keep available, but the  
5 -- the idea here is to kind of cut out the extraneous  
6 -- nice to have information and -- and to have the  
7 other good information that is currently there  
8 relocated there into another location.

9 So we would be going from four BTPs to --  
10 seven BTPs, excuse me, to four BTPs -- including our  
11 favorite BTP, 719. That would be one of the ones that  
12 would potentially be kept. And we -- we think that  
13 this -- the plan for the new SRP -- the modernized  
14 SRP, it really takes into consideration the lessons  
15 learned when we developed the NuScale design-specific  
16 review standard, the DSRS, and the Design Review Guide  
17 for Advanced Non-light Water Reactors.

18 And we are in -- we're still in the  
19 initial planning phases for completing this work. So  
20 we don't have a concrete schedule. But we will be  
21 developing an action plan and prioritizing certain  
22 sections. We're not going to do this all at once.  
23 It's going to be coming in sections and chunks. And  
24 we will definitely keep you informed of what that  
25 schedule ends up looking like. And this is part of

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1 the SRP review schedule. So part of the process is  
2 public comment and ACRS review, if desired.

3 CHAIR BROWN: It's -- it would be desired.  
4 And I can save you all a lot of time. Just take the  
5 existing new DRG and take away the non-light water --  
6 or advanced reactor part and you've got your new  
7 Chapter 7. We made that comment in our letter -- or  
8 equivalent comment.

9 MS. JOHNSTON: Yes. Thank you for that  
10 input.

11 CHAIR BROWN: And it's -- the DRG was a  
12 development over all the DSRs we did, which were  
13 significant improvements and focused -- it's an  
14 architecture-focused approach as opposed to a  
15 piecemeal -- you know, look at the tires and then look  
16 at the brake linings and then look at the fuel line  
17 and then look at the fuel pump and then try to figure  
18 out whether you've got a car or not. It's an  
19 architecture-based approach to the -- Chapter 7  
20 instrumentation, standard review plan approach. As  
21 opposed to piecemeal.

22 MS. JOHNSTON: Yes.

23 CHAIR BROWN: And I think we made that  
24 observation in our letter. I don't remember that.  
25 I'd have to go back and look.

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1 MS. JOHNSTON: Yes. Yes -- the DRG that  
2 you're referring to was issued in March of this year  
3 and --

4 CHAIR BROWN: Yes.

5 MS. JOHNSTON: And we -- we did note that  
6 positive feedback during that guidance development.

7 CHAIR BROWN: Okay. All right. Any other  
8 questions from any other members? I think, Jeanne,  
9 are you finished?

10 MS. JOHNSTON: I think I am.

11 CHAIR BROWN: Okay. Next slide is --  
12 waters. However, it is now 11:00. Actually, it is a  
13 little after. We'd have a scheduled break. I have a  
14 dog.

15 (Laughter.)

16 CHAIR BROWN: Therefore we're going to take  
17 a break for 15 minutes until 11:20. So we'll resume  
18 again at 11:20 if that's acceptable to everybody?

19 (No audible response.)

20 CHAIR BROWN: No arguments? We are --  
21 what's the proper -- we're in recess.

22 (Whereupon, the above-entitled matter went  
23 off the record at 11:05 a.m. and resumed at 11:21  
24 a.m.)

25 CHAIR BROWN: Okay. I see it's 11:21.

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1 And, Mike, are you ready?

2 MR. WATERS: I'm ready. Can you hear me?

3 CHAIR BROWN: Yeah, I can hear you.

4 Can everybody else hear Mike Waters?

5 MEMBER SUNSERI: Yes. This is Matt.

6 CHAIR BROWN: Okay. I'll take one  
7 response as being we can all hear okay.

8 Mike, why don't you go ahead? We'll start  
9 the remaining part of the presentation.

10 MR. WATERS: All right. So good morning.  
11 Thank you, Charlie and the members, for being here  
12 today.

13 So the ACRS, as part of this briefing,  
14 asked to hear about specific license activities, some  
15 that have been completed in the past and some that are  
16 ongoing or will happen in the future, as well as  
17 topical report reviews. So I'll jump in and go  
18 through some of the key licensing activities, and then  
19 Rich will finish on the topical report reviews.

20 So first, Michael, jump to the next slide.

21 Recently completed. We recently approved  
22 an amended request for the Waterford Core Protection  
23 Calculator System upgrade. Entergy is replacing its  
24 existing Core Protection Calculator with the Common Q  
25 CPC technology. The CPC, of course, calculates heat

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1 generation and DNDR. The lights trip functions to the  
2 system if necessary to protect safety limits.

3 I want to note -- you already know -- this  
4 Common Q CPC technology has improved, is approved, and  
5 is currently in use at Palo Verde. This indeed was  
6 our first successful test run of Revision 2 of ISG-06,  
7 including alternate review process.

8 As Jeanne noted earlier, alternate review  
9 process still focuses on system architecture,  
10 fundamental design principles, and functional design  
11 requirements, as the traditional process, but also has  
12 a heavier focus on software development plans and  
13 vendor oversight plans as what I call a new feature of  
14 the licensing basis. This allowed for an earlier NRC  
15 approval of the system during Entergy's design  
16 development timeline.

17 I also want to note effort not only  
18 involved our I&C team but also include a range of HFE  
19 reactor systems, technical specification, risk analyst  
20 experts, expert project managers, our vendor  
21 inspectors, in collaboration with regional inspectors.  
22 They did a great job working together to integrate a  
23 team to bring this review to completion within one  
24 year.

25 CHAIR BROWN: Mike, could I ask you a

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1 question?

2 MR. WATERS: Please.

3 CHAIR BROWN: I don't remember us looking  
4 at this. We did the Diablo Canyon one. I know Rich  
5 presented that several years ago, which has a very  
6 good architecture approach and diagrams and stuff to  
7 do that. Did you all end up getting the ISG-06, an  
8 equivalent good architecture, when you talk about the  
9 fundamental design with the independence and  
10 everything shown?

11 MR. WATERS: Yes. We really focused on  
12 that. I will note, of course -- and I'll -- I&C  
13 experts will slight the terminology I use, but this is  
14 a piece component of the overall reactor protection  
15 system. So we looked at that within that context.  
16 And I'll be happy to have --

17 (Simultaneous speaking.)

18 CHAIR BROWN: -- analog? I mean,  
19 previously --

20 MR. WATERS: No, it was a digital to  
21 digital replacement.

22 CHAIR BROWN: Okay. All right. Now I'm  
23 remembering. I'm remembering seeing some of the  
24 correspondence on it, then.

25 MR. WATERS: So, in my viewpoint, other

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1 than the changes within the CPC architecture, per se,  
2 there was not a change to overall protection scheme  
3 and architecture.

4 CHAIR BROWN: So this was largely a  
5 platform replacement, then, a computing platform  
6 replacement.

7 MR. WATERS: I would say a new technology,  
8 but of course, the platform had application-specific  
9 programming and configuration, of course. But yes --

10 CHAIR BROWN: Yeah --

11 (Simultaneous speaking.)

12 MR. WATERS: -- CPCS.

13 CHAIR BROWN: I'm talking about the  
14 hardware itself and the operating system and stuff  
15 like that, the Common Q operating system --

16 MR. WATERS: Right, right. That's what  
17 was --

18 (Simultaneous speaking.)

19 CHAIR BROWN: -- many, many -- several  
20 different places. I think APR1400 used it --

21 (Simultaneous speaking.)

22 MR. WATERS: Right. Right.

23 CHAIR BROWN: So did somebody else before  
24 that. Was it AP1000?

25 MR. WATERS: Well, for CPC, I can't

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1 distinguish between the CPC versus the other pieces of  
2 the reactor protection system. I don't know if -- is  
3 that your question? I --

4 CHAIR BROWN: No, the Common Q platform  
5 was used in at least two different --

6 MR. WATERS: Yes.

7 (Simultaneous speaking.)

8 CHAIR BROWN: -- certifications that I  
9 remember.

10 MR. WATERS: I believe --

11 (Simultaneous speaking.)

12 CHAIR BROWN: -- with FPGA's and --

13 (Simultaneous speaking.)

14 MR. WATERS: -- and AP1000 is Common Q.

15 CHAIR BROWN: That's what I thought, and  
16 AP1400 used Common Q also, if I remember correctly.

17 MR. WATERS: I believe --

18 CHAIR BROWN: Okay.

19 MR. WATERS: I'll ask my staff to cut me  
20 off of a --

21 (Simultaneous speaking.)

22 CHAIR BROWN: I just threw that out, just  
23 -- it's irrelevant. Don't worry about it.

24 MR. WATERS: Okay.

25 CHAIR BROWN: Okay. I just -- I thought

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1 I remembered hearing this, and I thought this was just  
2 a piece within the digital design that they already  
3 had --

4 MR. WATERS: Right.

5 CHAIR BROWN: -- is what you just said.  
6 Okay.

7 MR. WATERS: Exactly.

8 CHAIR BROWN: Thank you.

9 MR. WATERS: To finish this one up -- and  
10 it kind of dovetails ISG-06. What was interesting  
11 about this review was the requested review timeline  
12 and Entergy's development timeline really did not  
13 follow the ideal timeline that we assumed back in 2018  
14 for ARP, as we briefed you.

15 This is because Entergy proceeded with  
16 full development and the build-out of the system in  
17 parallel with our licensing review. Entergy in  
18 Westinghouse, for example, completed factory  
19 acceptance testing in early August, which overlapped  
20 with the tail end of our license review.

21 Therefore, it was important to note we  
22 simply conducted inspections at the vendor site in  
23 parallel with the licensing review. The inspections  
24 were not used as part of the staff basis for approval.  
25 Rather, it was conducted in parallel because of the

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1 time Entergy's developing the process and heavy focus  
2 on their development of the system at the vendor under  
3 Appendix B.

4 CHAIR BROWN: So Waterford kind of was  
5 betting that everything would come all right, come out  
6 okay, and they went ahead and started.

7 MR. WATERS: Well, betting -- yes. I  
8 mean, they took that business risk, I guess I would  
9 say. And a note I'll say in the next slide, that  
10 seems to be an Entergy trend, which we'll probably see  
11 for Turkey Point and Limerick, the fact that they'll  
12 be developing and building the system significantly  
13 during our license review.

14 CHAIR BROWN: Okay. Go on. Thank you.

15 MR. WATERS: So, as a note here, we're  
16 going to apply the alternate review plan process  
17 lessons learned to upcoming Turkey Point/Limerick  
18 LARs. And let me go to next slide to talk about it a  
19 little bit more specifically.

20 So these are some of the key lessons we  
21 derived from our exercise of ISG-06, including not  
22 only Waterford, but we've had significant ratification  
23 meetings with Turkey Point and Limerick. As Jeanne  
24 noted earlier, we have both an alternate review  
25 process and traditional tier review process defined in

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1 ISG-06, which really focuses on the types of design  
2 information submitted to NRC and the timing.

3 I would say in reality we used maybe a  
4 blended approach in some limited areas for Waterford  
5 because, a fact of life, design approaches and timing  
6 by industry during development of our system, as I  
7 mentioned, as well as regulatory insights and needs we  
8 identified during our review to make sure we get the  
9 complete safety evaluation as efficient as possible.

10 First one, the scope of the vendor  
11 oversight plan, that was a key challenge area, I would  
12 say, both for Entergy and NRC. As I noted, the vendor  
13 oversight plan formed a significant basis of our  
14 licensing approval under normal review process. ISG-  
15 06 did not have specific guidance on the details  
16 expected in the vendor oversight plan.

17 But the goal of the vendor oversight plan  
18 is to ensure the licensee has a heightened focus on  
19 development plans and vendor's product and analysis.  
20 I would say, in a similar manner, the NRC had  
21 traditionally evaluated and passed license decisions.

22 So Entergy forged new ground in developing  
23 the oversight plan for their upgrade. I think from  
24 our perspective, there were a couple challenges early  
25 on. I think, one, we were challenged to understand

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1 how the execution of their vendor oversight plan  
2 interfaced with our specific Appendix B QA processes.

3 And we had a lot of back and forth to line  
4 and level of detail required in their oversight plan  
5 and the vendor oversight plan summary on the docket.  
6 This involved significant discussions and requests by  
7 staff to ensure that critical attributes and features  
8 of the implementation testing phase were appropriately  
9 captured in the vendor's oversight plan.

10 Let me touch upon a few more. Crediting  
11 self-diagnostics, that's not new, per se. We've  
12 approved that in past applications. But eliminating  
13 the surveillance requests, such as channel operability  
14 tests, represented a significant technical  
15 specification change pursued by Entergy. And it's a  
16 big driver for whatever upgrades that we'll see come  
17 down the road.

18 However, there's not detailed guidance in  
19 ISG-06 on what is needed to do that, so given the  
20 pursuit of self-diagnostics, we had a heavy focus on  
21 engaging Entergy on ensuring that the self-diagnostic  
22 functions accomplished the same intent of the  
23 traditional tech spec surveillances to verify  
24 operability. And this required greater design  
25 description of the self-diagnostic features and

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1 effects and diagnostic analysis to address subsystem  
2 failures and diagnostic coverage.

3 And, on that note, staff has continued to  
4 communicate to future licensees on the needs to take  
5 credit for self-diagnostics in their platforms to  
6 eliminate surveillance testing.

7 CHAIR BROWN: If I remember correctly --  
8 and I just looked it up in ISG -- there were -- the  
9 ultimate review process is it was intended to be a  
10 simplified and more streamlined approach, but it still  
11 emphasized the design approach of looking at the  
12 system architecture, if you look at the text of the  
13 ISG.

14 So I'm not so sure it was as applicable to  
15 Waterford as it would be for Turkey Point and  
16 Limerick. But --

17 MR. WATERS: That's correct. I mean, the  
18 system architecture fundamental design principles,  
19 including diversity and defense in depth, are  
20 fundamental looks here that we've not changed or  
21 altered. So you're correct about the Waterford. And,  
22 as I'll note when we get to Turkey Point and Limerick,  
23 we've started to have application discussions on  
24 system architecture already to talk about those  
25 things.

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1                   So that's not changing. That's a  
2 foundation of our review is making sure the system  
3 architecture is safe and compliant with applicable  
4 regulations, of course, and IEEE standards.

5                   CHAIR BROWN: This also parallels the DRG  
6 --

7                   MR. WATERS: Right.

8                   CHAIR BROWN: -- that you all developed,  
9 staff developed, from all the DSRS work.

10                  MR. WATERS: Right. And if you look --  
11 you know, it's been a while since we briefed on ISG-  
12 06, so if you look at section D.2 of ISG, it provides  
13 a specific guidance for system architecture  
14 evaluations.

15                  CHAIR BROWN: Yeah. Okay. We don't want  
16 to lose that. That's the most critical part of all of  
17 this, is the architecture approach, which we have been  
18 doing and proceeding through now for the last ten  
19 years. So all right. Good. Thank you.

20                  MR. WATERS: All right. Just a couple  
21 more here. I'm not going to cover them all.

22                  Use of risk insights. Now, this was not  
23 a risk-informed review, as you may be familiar with.  
24 But we did have an innovative review team, and we took  
25 an innovative approach to more purposely consider up

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1 front those risk-informed principles to help guide us  
2 on some of the finer technical issues during the  
3 Waterford review.

4 The team still followed ISG-06, but we did  
5 consider some risk insights in the safety evaluation  
6 on some issues. And we documented that at a high  
7 level in that safety evaluation, and we hope to  
8 continue that for future reviews.

9 And finally, on this slide -- I did allude  
10 to it earlier -- the alternate review process was  
11 originally conceived really to give Entergy a  
12 licensing decision before they spent significant  
13 resources on procuring and fabricating digital  
14 systems. However, as I noted, Entergy elected, again,  
15 to develop the system in parallel to license review.

16 This does seem to be the current Entergy  
17 trend. Therefore, we had to continue our license  
18 review but also plan and implement inspections in  
19 parallel. That may have caught the licensee off guard  
20 to some degree. We had to explain the wall between  
21 licensing review and audits and inspection. We did  
22 that, and we had to really record our resources. And  
23 that's a learn we're going to continue to communicate  
24 for future reviews given the current trend here.

25 Any questions before I move on to Turkey

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1 Point?

2 CHAIR BROWN: You're on to 06 lessons  
3 right now, so --

4 MR. WATERS: Right. Right.

5 CHAIR BROWN: Go ahead.

6 MR. WATERS: So, next slide, Turkey Point.

7 CHAIR BROWN: Okay.

8 MR. WATERS: So we expect to receive this,  
9 I guess, next week. This indeed is a more substantive  
10 upgrade to reactor protection system, engineered  
11 safety features, and nuclear instrumentation systems.  
12 Florida Power & Light has requested us to use all the  
13 review process in ISG-06.

14 This system incorporates the Tricon  
15 digital platform. As you may know, the NRC has  
16 previously approved the Tricon topical report, I  
17 believe in the 2012 time frame, so sort of a  
18 referenced and approved tropical. And as you may  
19 recall, I believe Tricon technology was used in part  
20 in Diablo Canyon in the digital upgrade, as well,  
21 approved back in the 2015/2016 time frame.

22 The upgrade will employ a diverse  
23 actuation system for a limited number of I&C systems.  
24 And also, as noted here, the licensee intends to  
25 credit leak before break detection as diverse means

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1 within the D3 assessment. And staff will use the  
2 guidance in BTP 7-19 Revision 8 to address and review  
3 the D3 approach.

4 So far, we've had approximately eight  
5 ratification meetings to methodically step through the  
6 key elements of a LAR. Again, as discussed, the plan  
7 system architecture fundamental design principles were  
8 discussed under oversight plans, EQ, human factor,  
9 technical specifications, and I'm sure other important  
10 safety issues as well.

11 As far as status, FPL has requested --  
12 well, will request review and approval schedule  
13 supports a spring 2023 outage, installation for 2023  
14 outage. We have to communicate that this is an  
15 aggressive schedule given the complex scope of the  
16 upgrade and the additional technical issues associated  
17 with a review.

18 We expect as a next step, once we receive  
19 it next week, to complete an acceptance review,  
20 development of a detailed schedule if we accept it for  
21 review, and we'll circle back with the ACRS on the  
22 appropriate briefing time on the system.

23 CHAIR BROWN: Is there going to be a  
24 separate -- I mean, this is I&C. This is not a whole  
25 plan. So I presume part of their design or their LAR,

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1 whatever the documents are, there will be a complete  
2 architecture diagram similar to what we've seen on the  
3 last two design certifications, something that  
4 demonstrates the architecture and the meeting the  
5 fundamental principles.

6 And even though nobody wants to cover  
7 unidirectional communications, that will be an issue  
8 when we talk about it when we review it. And we will  
9 need that good architecture diagram. That made the  
10 NuScale and the APR1400 reviews extremely easy from  
11 the Advisory Committee standpoint.

12 MR. WATERS: Yes. Yes -- yes, we --  
13 (Simultaneous speaking.)

14 MR. WATERS: The short answer is yes. We  
15 have seen their preliminary diagrams or architecture.  
16 I can't discuss it here because some of that  
17 information is proprietary.

18 CHAIR BROWN: That's fine.

19 MR. WATERS: But to the extent you have  
20 access to it, we'll share as part of that briefing.

21 CHAIR BROWN: Well, we will have to have  
22 the architecture configuration in order to do our  
23 review.

24 MR. WATERS: Sure.

25 CHAIR BROWN: Bottom line. Just like

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1 Diablo Canyon.

2 MR. WATERS: Sure. I would expect the  
3 same level of information to be provided at the time  
4 we brief you.

5 CHAIR BROWN: That also made our review of  
6 the Diablo Canyon when it was obvious that they met  
7 all the touch points. So --

8 MR. WATERS: And I'll say if we don't have  
9 the architecture up front, it's highly unlikely we  
10 would accept it for review to begin with. So we'll  
11 have access to that information up front.

12 CHAIR BROWN: Okay. Thank you.

13 MR. WATERS: Okay. Next, Limerick.  
14 That's a year from now. Limerick represents another  
15 substantial upgrade. They intend to integrate the  
16 protection and safety systems into a plant protection  
17 system using the Westinghouse Common Q technology.  
18 And, as you've just noted, Common Q has been used  
19 elsewhere, and we have an approved topical report for  
20 that as well as revisions to that topical report.

21 What's a little unique here is Exelon has  
22 a public-private partnership with DOE's Light Water  
23 Sustainability Program for implementing this upgrade.  
24 As we understand it, Exelon, in part, has worked with  
25 DOE on cost analyses and development aspects of the

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1 planned upgrade.

2 Exelon also intends to use new industry  
3 guidance that they developed themselves for digital  
4 implementation. Exelon has noted they will share  
5 those experimental utilities as part of the  
6 partnership with DOE.

7 And, again, one key feature proposed by  
8 Exelon is elimination surveillance tests to really  
9 reduce their long-term cost burden to maintain I&C  
10 system. Again, we have engaged with Exelon in  
11 multiple pre-application meetings -- at three, I  
12 believe. And, again, we've begun to discuss system  
13 architectures and the fundamental design principles.

14 But they are continuing to develop their  
15 systems, and we expect to have additional pre-  
16 application meetings as they ramp up to submittal,  
17 currently scheduled for September of 2022.

18 CHAIR BROWN: Is theirs an existing  
19 analog?

20 MR. WATERS: Yes, I believe it's analog --  
21 (Simultaneous speaking.)

22 CHAIR BROWN: It says upgrade, so I'm  
23 presuming it was analog before.

24 MR. WATERS: Yes --  
25 (Simultaneous speaking.)

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1 CHAIR BROWN The word integration is what  
2 is curious, the way it's used for RPS, NSSS, and ECCS.  
3 I don't know how integrated integrated is.

4 MR. WATERS: Well, right. That's good and  
5 -- that's correct, and that's a focal area, as well,  
6 in the application space: what is that integration?  
7 And again, obviously, as you know, the first question  
8 of fundamental design principles, of independence,  
9 redundancy, and defense in depth and diversity are  
10 questions we'll continue to ask. And that will be a  
11 focus of our discussions.

12 CHAIR BROWN: Okay. We'll be looking  
13 forward to that. Hopefully I'm still alive then, too,  
14 so -- it's only a year away, maybe.

15 MR. WATERS: Well, Charlie, I hope NRC  
16 will be briefing in the next ten years, up here in the  
17 next ten years. Myself, I hope to win the lottery or  
18 retire, but at least someone will be here to brief  
19 you.

20 CHAIR BROWN: Okay.

21 MR. WATERS: All right. Let's shift gears  
22 slightly to non-power production utilization  
23 facilities, the SHINE. I know you've requested to  
24 hear about SHINE and AFRRRI, and I know you've  
25 coordinated separately with our colleagues and DANU on

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1 the overall SHINE --

2 (Simultaneous speaking.)

3 CHAIR BROWN: I want to be a little  
4 careful on SHINE because, yeah, we're obviously going  
5 to be looking at that, but there's -- I don't know  
6 where they stand right now. So there's a lot of stuff  
7 going on relative to scheduling for that.

8 MR. WATERS: Yeah, I -- right. And so  
9 this is going to be very high level, just keep it as  
10 a status and what we're looking at for I&C and leave  
11 it at that.

12 So, as you know, the SHINE has two primary  
13 facilities, their radiation facility and radioisotope  
14 production facility. All these facilities would be  
15 licensed under 10 CFR Part 50 if approved. On the  
16 slide are some of the key I&C systems we are currently  
17 in the process of reviewing right now.

18 One is a highly integrated process control  
19 system, PICS. And, as the name implies, it's  
20 integrated and controls both irradiation processes at  
21 the target solution and extraction operations in the  
22 radioisotope production facility.

23 The reaction protection system protects  
24 safety limits within the target solution vessel during  
25 irradiation, and it monitors things such as neutron

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1 flux, temperatures, and other flow parameters, and  
2 obviously actuates shutdown of the process and can  
3 move the solution to a safe configuration if limits  
4 are approached.

5 In a similar manner, the integrated safety  
6 features protects against potential accidents and  
7 events or inadvertent releases in both the irradiation  
8 facility and the radioisotope production facility,  
9 again, primarily by actuating shutdown, confinement,  
10 or hydrogen mitigation actions upon radiation levels  
11 and pressure levels that approach predefined limits.

12 Just one note that the TRPS and ESFAS are  
13 actually based on the variation of the HIPS FPGA  
14 platform technology, which has been previously  
15 certified for use in the NuScale reactor design. It's  
16 not the same design configuration you may be familiar  
17 with, but SHINE does reference the HIPS topical  
18 platform, and again, we're in the middle of reviewing  
19 that. And I believe ACRS was briefed on the HIPS  
20 platform earlier, in April 2017.

21 CHAIR BROWN: That's correct.

22 MR. WATERS: Number 2 says --

23 (Simultaneous speaking.)

24 MR. WATERS: Yeah.

25 CHAIR BROWN: Go ahead. Go ahead. Go

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1 ahead.

2 MR. WATERS: The radiation monitoring  
3 system and neutron flux systems are systems, again, as  
4 it suggests, monitor radiological and nuclear  
5 parameters in both facilities and provides inputs to  
6 both the process control system and those two safety  
7 systems.

8 One important thing to note here is staff  
9 is not applying specific review guidance ISG-06 or  
10 BTP 7-19 as we would for operating reactors. We are  
11 using applicable portions of NUREG-1537 standard  
12 review plan and criteria for non-power reactors.

13 Again, this SRP has fundamental guidance  
14 criteria that covers a large variety of research and  
15 non-production designs. Nonetheless, the fundamental  
16 design principles and performance-based approach  
17 criteria are the same here as it would be for  
18 something like ISG-06, just a different process and a  
19 different level of scope of review.

20 CHAIR BROWN: Okay.

21 MR. WATERS: I can't discuss schedule too  
22 much here.

23 CHAIR BROWN: No, you ought to stay away  
24 from that.

25 MR. WATERS: Okay.

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1 CHAIR BROWN: Ron, I don't want to step on  
2 any -- are you still there?

3 MEMBER BALLINGER: Yeah, I'm here.

4 (Simultaneous speaking.)

5 MEMBER BALLINGER: Schedule is, shall we  
6 say, fluid.

7 CHAIR BROWN: Okay. I didn't want to get  
8 involved in getting into any areas that we're not  
9 engaged with or know what the results are. So we'll  
10 stay away from scheduler stuff right now. All I know  
11 is we haven't seen any of this yet, so --

12 MR. WATERS: Right. And my final note is  
13 our Advanced New Reactor Division will obviously  
14 coordinate with ACRS with our engagement plans for all  
15 the areas that are needed to be briefed on.

16 CHAIR BROWN: Okay.

17 That's consistent, Ron?

18 MEMBER BALLINGER: Yeah. Yeah.

19 CHAIR BROWN: Okay. Just wanted to make  
20 sure I didn't step out of the box, as I am somewhat  
21 bent on doing every now and then.

22 Okay. Go on, Michael.

23 MR. WATERS: All right. Next one, the  
24 staff is also reviewing the Armed Forces Radiobiology  
25 Research Institute request to upgrade and replace

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1 their instrumentation control systems in its TRIGA  
2 reactor. It's replacing the system with a hybrid  
3 approach of new analog and digital systems.

4 As you know, AFRRRI is located down the  
5 street from NRC headquarters at Walter Reed Hospital  
6 and uses a reactor to research the effects original  
7 gamma neutron radiations in support of U.S. Department  
8 of Defense protection of armed service members.

9 The upgrade uses General Atomics analog-  
10 based nuclear instrumentation technology along with  
11 digital controls and monitoring systems. And, of  
12 course, the system primarily protects the fundamental  
13 fuel temperature safety limits by measuring and  
14 tripping against power levels and fuel temperatures.

15 And, again, the staff is using the NUREG-  
16 1537 to conduct our review. We hope to wrap up the  
17 primary safety review for I&C this year, and we're on  
18 target to issue a license decision in 2022.

19 CHAIR BROWN: And you plan on involving  
20 the Advisory Committee?

21 MR. WATERS: No, we don't plan on engaging  
22 the Advisory Committee on this upgrade.

23 CHAIR BROWN: Is there a reason?

24 MR. WATERS: Well, we typically engage you  
25 all on very significant operating reactor design

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1       certifications and have not done so for the more  
2       modest RTR upgrades here.

3               CHAIR BROWN:    I don't know what the  
4       history is on these, so I'm totally blank when it  
5       comes to that.

6               Scott, are you on the line?

7               (Pause.)

8               CHAIR BROWN:    Larry?

9               MR. BURKHART:    I'm here, Charlie, yes.  
10       Please express the question again.

11              CHAIR BROWN:    Well, I was curious that  
12       this is a fairly -- overall upgrade.  I don't know  
13       what the Committee's involvement has been with these  
14       types of installations in the past.  I haven't faced  
15       one of these.

16              But right now, we're not on their list to  
17       review or evaluate the replacement of the old stuff  
18       with the new stuff, and I'm not even -- whatever the  
19       standards are.  So I'm kind of at a loss to know  
20       whether we ought to request a meeting on this subject.

21              MR. BURKHART:    Yeah, I mean, the guidance  
22       is -- as always, right?  If we think there's a safety-  
23       significant issue and it's agreed upon by the  
24       Subcommittee, that we would schedule Subcommittee  
25       meetings.

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1           So what I would recommend is that you have  
2 a discussion with your Subcommittee folks, and we  
3 engage in a discussion with the staff. And Christina  
4 can help on that.

5           MEMBER REMPE: So this is Joy. Maybe  
6 another question to Mike could clarify the situation.  
7 I know the MIT reactor -- which it wasn't a -- or is  
8 not a TRIGA -- did some sort of upgrade, I thought, to  
9 their control room. How many other university  
10 reactors, which are often TRIGAs, do such upgrades or  
11 have done them?

12           MR. WATERS: Well, just to step back,  
13 you're correct that MIT upgraded with analog and  
14 digital technology. Purdue did as well; went to all  
15 digital. We approve additional licensing actions.  
16 Again we have not by practice engaged ACRS on those  
17 reviews or RTR upgrades. They are indeed less safety-  
18 significant than the operating reactors we've talked  
19 about before.

20           The other question, other digital upgrades  
21 do happen RTRs under the 50.59 process. I can't -- I  
22 don't have the information on the extent to which that  
23 has been done. We can sure go back on that.

24           I would note for an AFRRI system upgrade,  
25 like you said, you can fall under the traditional

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1 licensing practice which has involved ACRS engagement.

2 CHAIR BROWN: I'm not criticizing --

3 MR. WATERS: Yes.

4 CHAIR BROWN: -- Mike. I'm just --

5 MR. WATERS: No. Yes.

6 CHAIR BROWN: -- not familiar with it.

7 I'm not trying to invent something new. We've got  
8 plenty on our plate right now and I'm not quite sure  
9 of where this falls.

10 MEMBER PETTI: So this is Dave. As I  
11 understand it the requirements are different than what  
12 we have for power reactors because of the lower hazard  
13 of these types of systems, but it might be interesting  
14 because of the microreactor angle where some would  
15 argue that the hazards of microreactors are more like  
16 some of these systems. It might be useful just to  
17 have a briefing of how they're different in terms of  
18 their requirements to help us understand some of that.

19

20 CHAIR BROWN: You mean between power  
21 reactors and the micro type or the --

22 MEMBER PETTI: No, between power reactors  
23 and these, the --

24 CHAIR BROWN: Yes.

25 MEMBER PETTI: -- test reactors so that --

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1 because it wouldn't surprise me if a microreactor  
2 would try to make the argument that they were similar  
3 in hazard to these guys here.

4 CHAIR BROWN: What's the power rating for  
5 these types of -- this system? Are they less than 20  
6 megawatts or 10 megawatts, or what?

7 MEMBER REMPE: That's a hard question to  
8 answer. They pulse up, right, Charlie?

9 MR. WATERS: Yes, how many kilowatt? I  
10 think 20 megawatt maybe or higher level I'm familiar  
11 with. So that's what I would offer is that the risk  
12 significance of these are much less. The systems are  
13 obviously less complex in an operating reactor. We're  
14 talking about measuring a small number of parameters  
15 primarily to protect fuel temperature. So it's an  
16 important safety review, but it is definitely less  
17 complex than you would expect for an operating reactor  
18 digital upgrade. And AFRRRI is one megawatt.

19 MEMBER REMPE: So this is Joy and I'm kind  
20 of along with what Dave had said that I wouldn't want  
21 to focus on a particular reactor, but an overview of  
22 what is typically done and how the staff does the  
23 review might be of interest.

24 As I recall there was a lot of -- wasn't  
25 it Department of Energy funding that helped with like

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1 the MIT upgrade or something? They got one of these  
2 larger infrastructure awards? And so it was something  
3 that -- my perception was they were doing it at a  
4 university reactor so they could get some insights on  
5 some of the benefits of doing -- for the other types  
6 of reactors even. So am I right in that perception?

7 MEMBER PETTI: I think you're right, Joy.  
8 I recall. I think they got one of those  
9 infrastructure awards.

10 MR. WATERS: Yes, so DOE does fund some  
11 improvements. I honestly can't tell you which ones  
12 are digital, which ones are not digital because other  
13 things go on of course in terms of improvements at  
14 RTRs.

15 I'll be happy to circle back with you to  
16 provide an overview of the differences if that's  
17 what's required for I&C, but I will offer it's for --  
18 it's not going to be as complex as it is for what  
19 you've heard about for ISG-06 and BTP 7-19 and all the  
20 Reg Guides.

21 MEMBER REMPE: How much is the --  
22 (Simultaneous speaking.)

23 MEMBER REMPE: -- to do it? I mean are we  
24 asking you to do something that's a pain to and you --  
25 I've heard earlier several times today that we have

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1 limited resources. Are we making you do something  
2 that's going to take a lot of effort or is it  
3 something that you've got -- it would be pretty easy  
4 to put together, I don't know, 10 or 15 slides or  
5 something like that to get what we're asking for?

6 MR. WATERS: Well, I&C will be happy to do  
7 it. Maybe not immediately, but happy to do it down  
8 the road to explain that aspect. And we can  
9 coordinate for our colleagues in DANU you to address  
10 any needs. I'll be honest, my broader concern is for  
11 example we want to make a decision as soon as possible  
12 in AFRI given the amount of security interest on  
13 that, so --

14 MEMBER REMPE: That's why I wouldn't focus  
15 you on a --

16 MR. WATERS: Right, right.

17 MEMBER REMPE: -- particular one. I'd go  
18 at a higher level that might be of interest. And I  
19 don't think it's urgent, but again maybe a discussion  
20 off line would convince that there's not much here  
21 that's going to be of interest to ACRS because we have  
22 limitations too (audio interference).

23 MR. WATERS: Yes, I think we can do so.  
24 Time is (audio interference), but we have engaged the  
25 (audio interference) reactor community. They ask the

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1 same questions: What are NRC expectations for a  
2 digital license for example? And so we've prepared  
3 for those type of discussions, and we can discuss off  
4 line or at a future update briefing on that aspect.

5 CHAIR BROWN: Just to springboard off of  
6 Dave and Joy, the microreactor thought process, they  
7 keep being thrown around. They are small, but they're  
8 more for delivering power as opposed to research. And  
9 it might be useful to see what these systems look like  
10 for us -- not have to do anything with it, but for an  
11 information standpoint so we can see how those are  
12 handled relative to any other discussions that may  
13 come up later.

14 Dave and Joy, is that consistent with --

15 MEMBER PETTI: Yes. So I mean to me my  
16 understanding is defense-in-depth is implemented  
17 somewhat differently in these systems, that control  
18 and protection are not separate necessarily (audio  
19 interference).

20 (Simultaneous speaking.)

21 CHAIR BROWN: Yes.

22 MEMBER PETTI: So it's these subtle  
23 differences that I think it would just be educational  
24 for us to understand because it's sort of an  
25 application of how you can change some of the

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1 requirements as the hazard changes.

2 CHAIR BROWN: Yes.

3 MEMBER PETTI: And that's really what  
4 we're struggling with. Part 53 is not going to  
5 consider certain aspects of microreactors, but they're  
6 going to consider others. So I think it just would  
7 help inform us in that.

8 CHAIR BROWN: One of your staff Norbert  
9 Carte -- are you there, Norbert? Your hand is up.

10 MR. CARTE: Yes, it was sort of in case  
11 Mike wanted my quick summary of some of the  
12 differences between NPUFs and power reactors.

13 CHAIR BROWN: Okay. Let's not -- I want  
14 to try to leave this at -- why don't -- Christina, can  
15 you work with Larry or do whatever we need to do to  
16 figure out just maybe an information briefing on what  
17 these look like?

18 MS. ANTONESCU: Yes, I will work with the  
19 staff, Member Brown.

20 CHAIR BROWN: Okay. And set up an  
21 Information Subcommittee meeting at some point, a  
22 half-day-type thing?

23 MS. ANTONESCU: Sure. I will do that.

24 CHAIR BROWN: Is that out of purview,  
25 Mike, Eric?

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1 MR. WATERS: Well, we can circle back to  
2 Christina. I know you're focused on microreactors.  
3 I'll be honest, that's outside of my knowledge, but I  
4 suspect that we're not going to have much yet on the  
5 I&C designs or those futures things.

6 CHAIR BROWN: No, no, no. We're not  
7 looking for that. We just want to --

8 MR. WATERS: Okay.

9 CHAIR BROWN: -- see what these look like  
10 so we'll have some idea of what we're --

11 MR. WATERS: Okay.

12 CHAIR BROWN: -- looking at when we get  
13 there.

14 MR. WATERS: Okay.

15 CHAIR BROWN: Those are in the future, but  
16 these are -- I think Dave and Joy are correct in that  
17 these provide a window into what we may be looking at  
18 in the future for some of these advanced reactor  
19 applications.

20 MR. WATERS: Yes, we'll circle back with  
21 Christina. I would suggest that our new reactor  
22 divisions would have the lead on this type of  
23 discussion with the ACRS, so --

24 CHAIR BROWN: That's fine. However you  
25 all --

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1 MR. WATERS: -- we'll circle back.

2 CHAIR BROWN: -- want to arrange it is  
3 fine. It doesn't make any different from that  
4 standpoint. We'll accept --

5 (Simultaneous speaking.)

6 MEMBER REMPE: Charlie?

7 CHAIR BROWN: Yes?

8 MEMBER REMPE: One other thing that has  
9 come up, I was involved in an instrumentation OECD-  
10 sponsored meeting last January -- oh, in December I  
11 guess and one of the points that was heavily  
12 emphasized is that these new advanced technologies do  
13 a lot of design development and instrumentation comes  
14 in at the last minute. And sometimes it's hard to  
15 backfit it in and you end up with a fully developed  
16 design and you can't get any instrumentation that will  
17 accomplish the objective.

18 And so I think it would be a worthwhile  
19 information meeting. And I would suggest that there  
20 be some discussions between you and Christina and the  
21 staff before we actually have the meeting to make sure  
22 some different aspects are included in that discussion  
23 because it's a good topic to think about.

24 CHAIR BROWN: Yes. No, we could get  
25 together informally as long as we don't violate

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1 anybody's rules.

2 MEMBER REMPE: Yes, absolutely. There's  
3 a lot of good things to think about on this topic and  
4 I would be interested in helping if you are trying to  
5 put together --

6 (Simultaneous speaking.)

7 CHAIR BROWN: No, no, that's -- we can do  
8 that. I'll let Christina work with the staff and  
9 we'll figure out what we got and then I'll -- we'll  
10 feedback what we find out with you and Dave and  
11 anybody else who wants to see it. And then we can see  
12 where we want to go forward.

13 MR. BENNER: Yes, Member Rempe raised a  
14 good point because I know there are activities out  
15 there of saying hey, for these advanced reactor  
16 technologies what are the needs for sensors going to  
17 be and how do they get there? So I mean we -- but  
18 again, we will -- the staff likely will have limited  
19 information on that. I mean ultimately our review is  
20 hey, if you need to sense a parameter, you better have  
21 a sensor that does it and can be environmentally  
22 qualified for the situation the sensor is going to be  
23 in. But regarding the actual development of advanced  
24 sensors, that clearly could be a challenge for some of  
25 these designs.

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1 CHAIR BROWN: Oh, yes, but my interest  
2 right now is to also -- I agree with that totally.  
3 Joy would agree with that also because we've faced  
4 that before. But here is a class or reactors that  
5 kind of mirrors in a way what these other ones -- the  
6 sizes that you might be dealing with and how do we --  
7 how does the instrumentation and protection systems  
8 align for those? Would it be appropriate for the  
9 other, what I call vision reactors -- aside from  
10 whether they can actually detect anything, what may --  
11 just from a scaling standpoint. So I think it would  
12 be interesting to see what these look like so that we  
13 can have some concept of what we may look like when we  
14 go to these advanced reactors.

15 So I agree there might be a technology for  
16 measuring something that may not exist. It's always  
17 -- people that have these great ideas always do that,  
18 but -- and then you're right, they can't produce a  
19 piece of stuff that allows you to monitor it. So that  
20 doesn't work very well.

21 But let's go ahead and stop this here, but  
22 let Christina work with the staff and just develop a  
23 half-day information brief that shows what these look  
24 like so that we can see physically what they look like  
25 as opposed to just viewgraph words, their

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1       extensiveness and such. And then we'll just have an  
2       idea of what may be proposed in the future.

3                   Is that okay, Christina? Larry?

4                   MS. ANTONESCU: Yes, member. We'll follow  
5       up with the staff and --

6                   CHAIR BROWN: Okay.

7                   MS. ANTONESCU: -- come up with a plan.

8                   CHAIR BROWN: Okay. And if they tell you  
9       who to -- just make sure you get with the right --  
10      whoever -- Mike and Eric ought to be able to tell you  
11      who the right people are to get with.

12                  MS. ANTONESCU: Sure. We'll include  
13      everybody.

14                  MR. WATERS: We'll forward this to the  
15      right people actually right now. So we'll do that.

16                  CHAIR BROWN: Okay. Any more on this from  
17      the members?

18                               (No audible response.)

19                  CHAIR BROWN: Okay. Let's move on then.

20                  MR. WATERS: All right. Rich, it's your  
21      show.

22                  MR. STATTEL: Good afternoon, everyone.  
23      I'm going to discuss several topical reports that we  
24      have recently evaluated. I want to point out up front  
25      that the -- several of these technical reports not

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1 only affect what the system designs will be, but also  
2 how the systems will be used in the future when the  
3 plants start taking advantage of some of the benefits  
4 that these new technologies offer. I'll be discussing  
5 the technologies involved. I'll also be discussing  
6 some technology developments that we are now seeing in  
7 these submittals.

8 So the first one is the HFC platform  
9 topical report. The HFC is an FPGA-based platform and  
10 it is an enhancement to a previous HFC-6000 I&C  
11 platform. The microprocessor technology-based 6000  
12 safety platform was evaluated back in 2011 and it was  
13 approved the NRC at that time for use in nuclear power  
14 plant safety-related I&C applications.

15 The scope of the staff's evaluation of the  
16 FPGA platform is it included the development and test  
17 plans, specifications, procedures used to perform the  
18 design and to perform V&V of standardized FPGA circuit  
19 boards that are part of that platform.

20 The SE scope also included the safety life  
21 cycle processes that are used for the development of  
22 the plant-specific logic in that platform. Many of  
23 the system development processes and design concepts  
24 are used for both the HFC-6000 and the FPGA platforms.

25 Now I'll note here one thing that's unique

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1 to this particular platform compared to others like  
2 Common Q. HFC intends to provide the FPGA and  
3 microprocess solutions as separate solutions for  
4 nuclear power plants to allow enhanced diversity for  
5 the protection systems.

6 Now we were not really -- we did not do an  
7 assessment of diversity between the two platforms. We  
8 basically -- one was evaluated in '11 and the other  
9 was evaluated here, but we do recognize they  
10 fundamentally use different technologies. So there is  
11 a certain amount of diversity between those two  
12 platforms. And we also have plant-specific action  
13 items in place to address the diversity at the plant-  
14 specific level, so those requirements would have to be  
15 followed up for anyone who references one or both of  
16 these platforms.

17 So that's the HFC platform. It's a pretty  
18 typical platform evaluation. Are there any questions  
19 before I move to the next technical report?

20 CHAIR BROWN: Yes, just maybe one, maybe  
21 two; I'm not sure.

22 MR. STATTEL: Yes.

23 CHAIR BROWN: The only FPGA platform I'm  
24 familiar with right now is the NuScale platform. This  
25 is -- I mean FPGAs are FPGAs. So we actually looked

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1 at the HIPS platform as part of the NuScale and we  
2 evaluated that independently from the overall system  
3 architecture.

4 MR. STATTEL: Yes.

5 CHAIR BROWN: We haven't seen either one  
6 of these that I'm aware of, the Committee hasn't, as  
7 a platform qualification. We did look at the Common  
8 Q I think years ago.

9 MR. STATTEL: Right. Well, actually  
10 Common Q does use FPGAs as well, so --

11 CHAIR BROWN: Yes, it's a mix. Yes, okay.

12 MR. STATTEL: Right. That's correct.  
13 Most platforms actually have some FPGA element to  
14 them, usually in the IO board, for example. It's very  
15 common for them to use FPGA technology there.

16 CHAIR BROWN: But not in the voting end or  
17 the --

18 MR. STATTEL: Right, which this is a bit  
19 unique because essentially they basically took their  
20 old microprocessor-based design and they built it --  
21 they basically transferred it into an FPGA logic,  
22 which is kind of interesting.

23 This isn't the first FPGA-based platform  
24 we've evaluated. Of course we evaluated the HIPS  
25 platform. We also evaluated a RATI platform which is

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1 all FPGAs. And there's a couple of others as well.  
2 So I would say this is like about our fourth FPGA-  
3 based platform that we've reviewed.

4 CHAIR BROWN: All I want to put on the  
5 table is that if we end up with a backfit, an LAR in  
6 an operating plant or a new plant, a new applicant  
7 design application, design certification that utilizes  
8 something like this where the Committee actually has  
9 not looked at the actual topical report, we would  
10 probably want to do that in parallel like we did with  
11 the NuScale setup. We did the HIPS first and then we  
12 looked -- then we did the Chapter 7 equivalent review,  
13 how it was applied.

14 So just keep that in mind; that's all I'm  
15 saying, as we go forward.

16 MR. STATTEL: Well, in light of that would  
17 you expect us to send you the Tricon platform in  
18 advance of or in parallel with the Turkey Point  
19 application?

20 CHAIR BROWN: Where else was that used?

21 MR. STATTEL: Tricon? That was the  
22 platform that was the primary platform for the Diablo  
23 Canyon application.

24 CHAIR BROWN: Okay. We did not look at  
25 that separately --

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1 MR. STATTEL: Correct.

2 CHAIR BROWN: -- for that. Actually I  
3 didn't know we hadn't, so that's probably why we  
4 didn't. I'm just thinking about that as we go, that's  
5 all. We did the HIPS thing in parallel, so --

6 MR. STATTEL: Yes.

7 CHAIR BROWN: -- I'm not sure I want to  
8 get out ahead of that before we go there. Let you all  
9 do your thing, but then it ought to be addressed as to  
10 why it's satisfactory when we get to an application.  
11 That's all.

12 MR. STATTEL: Okay. Well, I guess the  
13 same would be true for the Common Q platform because  
14 that platform was issued and it was evaluated and it  
15 has been updated several times.

16 CHAIR BROWN: Yes, and we --

17 MR. STATTEL: Recently. This year.  
18 Right, so --

19 CHAIR BROWN: Yes, we accepted that. I  
20 don't want to start something new here.

21 MR. STATTEL: Okay.

22 CHAIR BROWN: That's all.

23 MR. STATTEL: All right.

24 (Simultaneous speaking.)

25 CHAIR BROWN: -- questions. This is a

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1 good calibration, that's all.

2 MR. STATTEL: Yes. I'll just note that  
3 one of the things that's kind of unique to each  
4 platform we evaluate is the diversity aspect, and of  
5 course the licensee who is referencing the platform  
6 would have to address that in some way. In some  
7 platforms -- there's a couple platforms where it's  
8 actually addressed in the topical report. This is not  
9 one of them. And like the ALS platform for example  
10 has some diversity features built into that.

11 This one is different and unique in that  
12 basically they have two different platforms, one  
13 that's computer-based and one that's FPGA-based. And  
14 so basically they have that diversity because of the  
15 two different platforms that they have. Okay.

16 All right. I guess I can move to the next  
17 slide. So the next topical report I'm going to talk  
18 about is -- it's from Westinghouse and it has to do  
19 with self-diagnostic functions, right? The actual  
20 title of the topical report is a bit complicated, so  
21 I didn't include in this slide. It's actually Common  
22 Q Platform and Component Interface Module System  
23 Elimination of Technical Specification Surveillance  
24 Requirements.

25 So this topical report provides a method

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1 for determining if the technical specification  
2 surveillance requirements can be eliminated for plant  
3 safety systems that are based on the Common Q  
4 platform. So essentially they want to take credit for  
5 the diagnostic functions that the common platform  
6 performs, right?

7 So I'll point out here that we evaluated  
8 the self-diagnostic functions so they are described in  
9 the platform evaluation, but we never gave any credit  
10 for them as far as eliminating surveillance tests. So  
11 this topical report attempts to bridge that gap.

12 The method that's provided in the topical  
13 report involves a four-step process that establishes  
14 whether the Common Q platform self-diagnostic  
15 functions are capable of identifying and responding to  
16 system failures that would have otherwise in a more  
17 traditional manner been identified through manual  
18 surveillance tests.

19 The four steps; I'll just briefly describe  
20 them, they're identifying the system components that  
21 are tested in those manual tests. This is primarily  
22 directed at operating plants that have manual  
23 surveillance tests in place. The second step is  
24 identifying the failure modes of those components, and  
25 normally that's done through an FMEA-type analysis.

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1 The third step is mapping diagnostic functions to  
2 those failure modes. And the fourth step is  
3 evaluating if those self-diagnostic functions provide  
4 an adequate or equivalent means of identifying and  
5 responding to postulated component failures.

6 So I also want to point out that once the  
7 surveillances are eliminated from the tech specs the  
8 licensee still has an obligation to confirm the  
9 functionality of those self-diagnostic functions on a  
10 regular basis. This is typically accomplished through  
11 system walkdowns, operator rounds, or other  
12 administrative processes.

13 These methods have been used to eliminate  
14 several surveillance requirements for the recent  
15 license amendment for Waterford Core Protection  
16 Calculator System. And also similar methods were used  
17 by Vogtle. Now you know Vogtle's not operating of  
18 course, but in their original license they had planned  
19 to perform several manual surveillance requirements,  
20 surveillance tests. And they basically modified their  
21 license to eliminate those, the requirement to do  
22 those.

23 So I'm open to any questions on this  
24 topical report.

25 CHAIR BROWN: Yes, I have a question.

1 MR. STATTEL: Yes?

2 CHAIR BROWN: Not a negative question  
3 except I did the same thing back in my programs 20  
4 years ago when we started the microprocessor stuff  
5 with all the self-diagnostics. So we -- all  
6 throughout the -- that was part of the exact -- the  
7 whole sample period was the self-diagnostics. Part of  
8 the program sample time was devoted to that.

9 But we backed off on -- we used to do  
10 weekly trip point and calibrations. We actually then  
11 backed down to once every month and then we backed  
12 down to even less. But what we did is we checked the  
13 checker.

14 MR. STATTEL: Yes.

15 CHAIR BROWN: In other words, we had the  
16 self-diagnostics built in, but we had a manual means  
17 of checking the self-checkers. So periodically  
18 whether it's every six months or something like that  
19 you go in with the built-in self-checking function and  
20 you check that the self-diagnostics is actually doing  
21 what it's supposed to be doing.

22 I guess I would be uncomfortable with  
23 something that doesn't check that the checkers are --  
24 self-checkers are really working right. So I can see  
25 most of the major surveillance being eliminated, but

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1 if I was NRC I would be very hesitant to not have some  
2 way of checking periodically, and I don't know what  
3 the periodicity would be, to make sure that that self-  
4 checking function is actually doing what it's supposed  
5 to be doing by a human being.

6 MR. STATTEL: Right.

7 CHAIR BROWN: So that's just an  
8 observation.

9 MR. STATTEL: That's a very good  
10 observation, and we have similar reservations. So  
11 I'll mention that when this topical report first came  
12 in there was no provisions for checking the checker,  
13 as you mention. None at all. So essentially I'm  
14 relying on the system to tell me that it has a  
15 problem. And we definitely had concerns about that,  
16 right? So the system that has a problem, I don't  
17 really trust that system to tell me that it has that  
18 problem. So that's where these additional provisions  
19 came in.

20 Now I'll also mention that this has been  
21 a trend that's been going on ever since the digital  
22 technology started rolling out, but this is a new way  
23 of addressing it. So I'll mention the Ocone system  
24 that was installed about like 15 years ago. So in the  
25 Ocone system they essentially did the same thing.

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1 They didn't eliminate the surveillance tests; they  
2 basically rewrote the surveillance tests so that they  
3 were only checking the checker, like you mentioned.  
4 But they were still surveillance tests. That's how  
5 that plant had addressed that.

6 Here they're actually eliminating the  
7 surveillance tests, but they do still have that  
8 obligation to confirm the functionality of the self-  
9 diagnostic functions.

10 So we've pretty much held that line. We  
11 do have review guidance that tells us to verify that,  
12 that they're doing those things. And we have had this  
13 discussion with Turkey Point during our pre-  
14 application meetings so we expect that they will have  
15 those provisions in place as well.

16 MEMBER HALNON: This is Greg. I got a  
17 real quick question. Maybe it's more of a soap box,  
18 but as we get more and more self-diagnostics and doing  
19 things from computer screens I fear that there's an  
20 unintended consequence of getting people out of the  
21 plant. As an old operator I found many problems  
22 walking systems down and finding the right  
23 transmitters and thermocouples and whatever and  
24 putting my hands on them, making sure that we  
25 understand what's going on, especially in containment

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1 where you don't get to very often.

2 So I would just ask you to watch for the  
3 unintended consequences of becoming more and more  
4 detached from the physical plant and more and more  
5 attached to just software.

6 MR. STATTEL: Yes, I'm certainly in  
7 agreement with you on that point. One of the  
8 discussions we had with Westinghouse was I don't --  
9 I'm not really comfortable with operators just looking  
10 at the absence of an alarm and making an operability  
11 determination just based on that. And therefore when  
12 we review these, when we evaluate these, we try to  
13 understand what the operators have available to them  
14 as far as their assessments of operability.

15 And so for example, for Common Q the  
16 system creates logs as it operates. So even if  
17 there's no problem it basically puts status checks and  
18 puts those into logs. And those are things that the  
19 operator can look at periodically. They don't cause  
20 alarms, but the operator can look at it and verify  
21 that the system is in fact functioning. And those are  
22 the types of things that we would expect them to do on  
23 their operator rounds. Or system engineers do health  
24 reports and they'll do rounds and they'll check  
25 systems.

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1           So there are certain things that each  
2 platform -- it's unique to each platform, but there  
3 are certain things that the platform can provide to  
4 the operators and engineers and technicians to help  
5 them confirm that the -- not only that the system is  
6 operable, but that the self-diagnostics are in fact  
7 functioning correctly.

8           MEMBER HALNON: Yes, I think you got the  
9 right mind set. And as we move forward into more  
10 digital systems we tend to, what I would say, detach  
11 ourselves from the physical touch of the plant and I'm  
12 concerned about the absence of operators and  
13 technicians walking through the plants and actually  
14 doing work. And I say work as in physical touching  
15 and monitoring and finding things that even aren't  
16 associated with the system that they're going to, but  
17 because they're in the area they see it. So I  
18 appreciate that. Thanks.

19           MR. STATTEL: Thank you.

20           CHAIR BROWN: Greg, that's similar to --  
21 aside from the self-diagnostics that we did, we had  
22 the data loggers. You got to be careful on data  
23 loggers. If somebody's logging data every five  
24 seconds, then that becomes a blur of numbers.

25           MEMBER HALNON: Yes.

1 CHAIR BROWN: So it has to be done on a  
2 reasonable basis. But then what we had is the  
3 operators -- instead of manually taking their logs  
4 every hour they could go look at the data logger. And  
5 then they looked at the data coming out of the data  
6 logger. Then it was then printed I guess in some --  
7 I've forgotten this; it's been 22 years -- where they  
8 could have a separate record of it. So it wasn't  
9 subject to computer crash or data loss.

10 MEMBER HALNON: Yes.

11 CHAIR BROWN: The Navy loves paper, so the  
12 engineer could come back and look at the hourly logs  
13 and see hey, look everything looks okay for the last  
14 four years. So we didn't eliminate the ability to do  
15 it; we just eliminated the need for the operator to  
16 manually transcribe it onto pieces of paper. It was  
17 more compact.

18 MEMBER HALNON: Yes.

19 CHAIR BROWN: But your point is exactly  
20 right. You do not want the operators to lose touch of  
21 how the equipment is operating.

22 MR. BENNER: Just to inject, that is a  
23 broader issue and I will say that in our interactions  
24 with DOE I think they are working with industry as to  
25 how do you replicate that through wide-ranging sensors

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1 that are monitoring equipment and things like video  
2 cameras or audio? I mean, so there clearly isn't  
3 clarity on what they answer is.

4 But I think, Member Halnon, the idea that  
5 eyes and ears in the plant provides a value is  
6 acknowledged and it's -- even if you're removing some  
7 human beings from the plant, are you replicating those  
8 eyes and ears in other acceptable ways.

9 MEMBER HALNON: Yes, that's exactly it,  
10 Eric. Thanks.

11 MR. STATTEL: There's two additional  
12 points I'd like to make: One is the self-diagnostics  
13 are far better at identifying problems from what we've  
14 seen than human beings as far as just relying on  
15 periodic surveillance tests. So a typical analog  
16 system sometimes -- it's not uncommon for a  
17 surveillance test to be performed once a quarter. So  
18 literally the plant could be operating for three  
19 months and not know that there's a degraded component  
20 or something in place until that surveillance interval  
21 comes up, whereas by and large the vast majority of  
22 self-diagnostic tests are continuously performed.

23 Typically within a second of a component  
24 failing or reaching a limit there's an alarm, the  
25 operator questions the operability. It basically

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1 prompts to go look at the system and do a verification  
2 of operability. So there's a lot of benefits that are  
3 provided by self-diagnostics. I don't want to  
4 underestimate that.

5 The second thing I'd like to point out is  
6 that from our experience with Vogtle and with  
7 Waterford not all surveillance tests are being  
8 eliminated, right? There are portions of the system  
9 that are not reachable, that can't be verified by  
10 self-diagnostics, and this process we found to be a  
11 good way to identify those. So those come out in the  
12 failure modes and effect analysis. And if there's no  
13 way for the self-diagnostics to detect those failures,  
14 then the plant has to go in and manually do those  
15 either during refueling outages or on a periodic  
16 basis. So in both cases, in both Vogtle and Waterford  
17 there were certain surveillance tests that were  
18 retained. They determined that they needed to be  
19 performed anyway. Okay?

20 MEMBER MARCH-LEUBA: Yes, this is Jose.  
21 With respect to your first point it's always very  
22 common in human-machine interfaces that machine  
23 typically does much better.

24 MR. STATTEL: Yes.

25 MEMBER MARCH-LEUBA: The problem is that

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1 when the machines fail they fail catastrophically.  
2 They fail with a bang. So I agree that the self-  
3 testing is really good, but if you have a logic  
4 problem, you can produce a very large error, whereas  
5 humans are more unreliable, but they don't tend to  
6 fail that bad. That's something to consider.

7 MR. STATTEL: Thank you.

8 CHAIR BROWN: I agree with Jose and I  
9 agree with Rich. I agree with Greg. The things on  
10 three months, maybe operators were taking logs roughly  
11 hourly, so now that burden has been relieved, but they  
12 still have to look at it hourly and they see the  
13 differences. The machine can tell you hey, you've got  
14 differences between channels and all other kind of  
15 stuff. They exceed certain parameters and give you a  
16 heads up that maybe something is drifting.

17 But self-diagnostics is just supremely  
18 better overall, but you still have to have people  
19 evaluate to make sure it's really working the way it's  
20 supposed to. And that's where the operators come in.  
21 So as long as that's still being emphasized I think  
22 that's the right way. You got to check the checkers  
23 no matter what regime it's in.

24 So you can go on, Rich, unless there's  
25 some other -- anybody else have a comment?

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1 (No audible response.)

2 CHAIR BROWN: Rich, you want to go on?

3 MR. STATTEL: Certainly. So the next  
4 topical report; a little bit of shift of gears. This  
5 is another type of use of technology.

6 So this is an AMS. That's a company down  
7 in Tennessee. They provided us with an online  
8 monitoring topical report. The online monitoring --  
9 so this topical report provides condition-based  
10 methods for performing online monitoring to be used as  
11 a means to identify whether in-service pressure  
12 transmitters need to be calibrated or repaired. Okay?

13 This methodology was developed to be used  
14 in nuclear power plants as an analytical tool to  
15 measure sensor calibration performance during plant  
16 operation between scheduled refueling outages which  
17 are typically the times when plant surveillance  
18 requirements for transmitters are fulfilled. That's  
19 when they do the manual calibrations.

20 The use of online monitoring technology  
21 enables licensees to identify pressure transmitters  
22 that have potential calibration performance issues  
23 during plant operation rather than relying on  
24 information gained during those periodic calibration  
25 tests that are performed pretty infrequently.

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1           The online monitoring methods that are  
2           presented in the topical report include the monitoring  
3           of calibration performance and the monitoring of time  
4           response performance to some degree. The method  
5           involves collection of transmitter signal data during  
6           plant startup, shutdown, transient and steady-state  
7           conditions. These methods are similar to methods that  
8           are widely used by plants today for monitoring  
9           performance of resistance temperature detectors, but  
10          in this topical report the methods are designed to  
11          address the unique characteristics of pressure and  
12          differential pressure transmitters. So it's kind of  
13          a limited scope topical.

14                 When a licensee applies the methods that  
15                 are outlined in this topical report, they can adjust  
16                 surveillance calibration frequencies based on the  
17                 analysis of the data they collect. They can also  
18                 credit the methods as a means of verifying transmitter  
19                 response time performance and to avoid certain  
20                 periodic time response testing for some pressure  
21                 transmitters, not all of them.

22                 The topical report also provides a method  
23                 for determining the maximum calibration interval which  
24                 is also based on the data, the online monitoring data  
25                 that is collected.

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1           So that's pretty much a synopsis of what  
2           this topical report is. It's recently approved so we  
3           haven't had any applicants reference it, but we do  
4           expect some in the near future.

5           MEMBER REMPE: So what was the basis for  
6           their assessment of extending the calibration  
7           interval, because with some sensors they just fail for  
8           other reasons or they degrade for other reasons that  
9           are hard to detect. So did they just do like 1,000  
10          and say -- and did they use different vendors, or how  
11          did they decide what the basis for extending the  
12          calibration interval was?

13          MR. STATTEL: That's a very good question.  
14          So within this topical report they did provide a  
15          significant amount of data that had been collected  
16          over the course of 15-20 years at various plants. The  
17          Sizewell plant in U.K. was one primary contributor to  
18          this because they had implemented an online monitoring  
19          program there. And so we looked at that data. And  
20          essentially they had applied these methods. Also some  
21          U.S. plants. I believe Vogtle 1 and 2 had applied  
22          these methods as well.

23          So the data shows -- so they had performed  
24          periodic calibrations and they found transmitters that  
25          were out of cal over the course of those years. And

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1 they basically went back in time and applied the  
2 online monitoring methods because they had the data.  
3 And so the question came would the online monitoring  
4 have identified that same transmitter as being out of  
5 calibration? And for the most part they did, right?  
6 So essentially the plants had been performing the  
7 periodic calibration of all their transmitters when  
8 they really -- if they had been applying online  
9 monitoring technologies they would have really only  
10 had to do a fraction of those calibrations.

11 So it's a very large amount of savings to  
12 the plants as far as sending technicians out to verify  
13 calibrations when that can be done by doing the  
14 comparisons of the signals from various transmitters.

15 Now catastrophic failures -- this topical  
16 report also -- it used several different types of  
17 transmitters, right? Barton, Rosemount were just two  
18 of those. But again it's limited scope, so we're only  
19 talking about differential pressure and pressure  
20 transmitters. And the topical report includes a  
21 failure modes and analysis of those types of  
22 transmitters, right?

23 And so, now catastrophic failures,  
24 typically those are easily identified even today  
25 either through surveillance checks, channel checks

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1 that operators perform once a day, for example, or in  
2 a lot of cases when a transmitter fails it's just  
3 immediately obvious.

4 Now the gradual failures, those are the  
5 ones -- you're correct, those are more difficult to  
6 detect and that's where we have a larger reliance on  
7 those manual surveillances. And by performing this  
8 online monitoring it's more of a continual comparison  
9 that happens on a far more regular basis. And what we  
10 found was that there were very few cases where  
11 calibrations were needed of transmitters that would  
12 not have been detected by this online monitoring.

13 MEMBER REMPE: So again from my background  
14 I'm sure what you did -- I'm guessing what you did is  
15 fine because I haven't looked at it, but if you really  
16 wanted more perfection would there have been any  
17 benefit if they'd done some cross-calibration with  
18 other parameters like, okay, this particular sensor  
19 was exposed to higher temperatures or seismic  
20 accelerations or higher fluxes of something like that?  
21 But basically your evaluated indicated they got most  
22 of them. Was it 90 percent of the ones that needed to  
23 be de-calibrated -- or re-calibrated but you guys --  
24 they caught with this method is basically what  
25 happened?

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1 MR. STATTEL: Well, I will mention the  
2 methods are kind of limited. When we say cross-  
3 calibration, basically we're comparing signals from  
4 multiple sensors that are measuring the same process.  
5 Okay? So that's a limitation of this method, right?

6 MEMBER REMPE: Okay.

7 MR. STATTEL: Now I mentioned that we had  
8 applied this for RTDs in the past.

9 MEMBER REMPE: Yes.

10 MR. STATTEL: That's commonly used. Now  
11 in a typical plant there is like 22 RTDs all measuring  
12 all the same temperatures, right? So it's not a big  
13 stretch to say that if -- it's very unlikely that all  
14 22 of those RTDs would drift in the same direction,  
15 right?

16 For pressure transmitters what we find is  
17 that typically there are four pressure transmitters or  
18 eight transmitters that are measuring the same process  
19 so you have a lot less comparison data to use. So  
20 it's a little bit more difficult to apply those same  
21 principles.

22 MEMBER REMPE: Okay. I'm just curious  
23 about it, but thank you. I'll take a look at -- I  
24 think that Christina sent us something and I'll go  
25 through it in more detail. I just didn't have time

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1 before this meeting, but I am interested in what  
2 they've been doing. Thank you.

3 MR. STATTEL: Yes.

4 CHAIR BROWN: Okay, Rich. Thank you. Go  
5 ahead.

6 MR. STATTEL: All right. So the next  
7 topical report I'll talk about is also a platform  
8 report. Now Holtec is -- they're doing a design for  
9 SMR-160. And they recently announced that they will  
10 be using the MELTAC I&C platform for their safety-  
11 related systems. So I'm here to talk about the MELTAC  
12 platform.

13 So MELTAC stands for Mitsubishi Electric  
14 Total Advanced Controller. This is a computer-based  
15 programmable logic controller that consists of a pre-  
16 defined set of hardware and software components that  
17 can be assembled to produce a safety system  
18 application such as reactor protection systems or  
19 ESFAS systems. So it's not unlike the other platforms  
20 that we've been discussing.

21 The MELTAC system processors are designed  
22 to be loaded with plant-specific application software  
23 to implement various nuclear plant safety system  
24 functions. The scope of the staff's evaluation of the  
25 MELTAC platform was very similar to what I discussed

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1 in the HFC platforms. The SE scope also included the  
2 safety life cycle processes which are unique to the  
3 MELTAC development for plant-specific applications.

4 I'll just mention there is one unique  
5 feature of the MELTAC platform as opposed to the other  
6 platforms we've evaluated, and that is that it  
7 includes two different software program manuals, one  
8 for platform software development and another software  
9 program manual for plant application software  
10 development.

11 So I know Member Brown had mentioned  
12 before that these systems use common like operating  
13 systems. And so this vendor -- and in our evaluation  
14 we acknowledged that. So there's basically two  
15 different development processes that we're looking at  
16 here, one for the operating system, kind of the high-  
17 level functional characteristics of the platform, and  
18 the other is for the plant-specific application  
19 developments.

20 So that's the MELTAC platform in a  
21 nutshell. Any questions on that topical report?

22 CHAIR BROWN: Kind of like your computer.  
23 You got an operating system and then you have all  
24 these other application softwares applied.

25 MR. STATTEL: That run underneath that.

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1 That's correct.

2 CHAIR BROWN: That run underneath that  
3 operating system. So that's very similar. I don't  
4 have any more questions on that.

5 Anybody else?

6 MEMBER HALNON: Yes, has that topical --  
7 are you guys actively reviewing that right now?

8 MR. STATTEL: We have completed the  
9 evaluation. We completed that in 2019.

10 MEMBER HALNON: For the MELTAC. But for  
11 the Holtec SMR?

12 MR. STATTEL: Oh. Oh, the Holtec topical  
13 report? No, I have not seen that. I don't know what  
14 the status of that is.

15 MEMBER HALNON: Okay.

16 CHAIR BROWN: All right. Is that the last  
17 slide? I think the last slide says goodbye or  
18 something like that. Closing remarks. Is that where  
19 we are, Eric?

20 MR. BENNER: That seems to be where we  
21 are. So I don't want to belabor the discussion. I  
22 think it's been a good discussion. I think going into  
23 this my -- where I was at was that we wanted to make  
24 sure the Committee was fully aware of all the things  
25 we were doing. I think the Committee is now fully

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1 aware. I think there were some moments here where now  
2 you're aware of some work in the -- particularly in  
3 non-power reactors and topicalals that haven't -- you  
4 haven't typically seen before, so that spurred some  
5 dialogue.

6 I also acknowledge that there are some  
7 areas where there may continue to be some different  
8 views between the Committee and the staff, and we are  
9 committed to continuing to have open dialogue on all  
10 those in forums such as this as well as the individual  
11 forums to look at individual guidance documents and  
12 individual licensing reviews.

13 So from my perspective anyway I believe  
14 our objective for the meeting was accomplished, but I  
15 certainly defer to the Committee to say if their  
16 objectives for the meeting were accomplished. So I'll  
17 end it with that.

18 CHAIR BROWN: Okay. Well, I'll save my  
19 comments for later, for the end, but are there any  
20 comments, go around the table, before I go to public  
21 comments? Are there any comments from the members or  
22 any closing remarks that they would like to make?

23 MEMBER REMPE: Charlie, this is Joy. I  
24 thought this was a very good meeting to provide some  
25 great perspective for us. And maybe I've missed it

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1 before, but I don't recall you doing something like  
2 this before, so I appreciate your efforts to have this  
3 as well as the staff efforts to participate.

4 CHAIR BROWN: Thank you.

5 Any other members?

6 (No audible response.)

7 CHAIR BROWN: Let me -- Christina, can we  
8 get -- I'll go to the -- before I make my closing  
9 comments I will go to public comments. Is the public  
10 line open?

11 MS. ANTONESCU: Yes, not yet. If anybody  
12 from the public would like to make comments, please  
13 un-mute yourself.

14 CHAIR BROWN: But the line is open itself?  
15 All they have to do is un-mute themselves, right?

16 MS. ANTONESCU: Yes, the line is --

17 (Simultaneous speaking.)

18 CHAIR BROWN: Okay.

19 MR. MOORE: This is Scott Moore, the  
20 executive director. If any members of the public want  
21 to make comments, you need to press \*6 to un-mute  
22 yourselves.

23 CHAIR BROWN: Oh, thank you, Scott.

24 MS. ANTONESCU: Yes, thank you.

25 CHAIR BROWN: Okay. Hearing none, I guess

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1 we just go on into -- let me finish my closing remarks  
2 just to amplify my fundamental reason for wanting to  
3 schedule a meeting like this was that we needed to get  
4 a better handle on what you all had on your plate that  
5 we wanted to review and not -- and so that we could  
6 get our toe in the water as a Subcommittee meeting on  
7 those issues before it got too late, so that we didn't  
8 hold up you all processing the Reg Guides and/or ISGs  
9 and/or whatever other documents we need that you've  
10 got on your table. I was a little surprised on 5.71,  
11 but we've got that at least on the table now to  
12 proceed with that review.

13 I was very, very pleased with the  
14 substance of the meeting. There was excellent I think  
15 interchange between the staff and us and our  
16 questions. And I really do appreciate the work that  
17 Jeanne and Mike and Rich put in to provide the  
18 information they did. It was very extensive and I  
19 think they did a very good job of getting the  
20 positions; as well as you did, Eric, on where we  
21 stand.

22 So I was pleased with the meeting. I do  
23 want to close with just the last thought that we need  
24 to be kept up to date in some way, shape, or form of  
25 upcoming documents: Reg Guides, ISGs, BTPs, whatever

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1 they are, because we do have a lot of stuff on our  
2 plate and we do like to see those particularly  
3 relative to safety -- reactor trip safeguards and/or  
4 other process things that we need to take -- we need  
5 to have a heads up so that we can schedule them and  
6 not -- and get comments into you before you finalize.

7 And in my area I typically like to have at  
8 least a choice of do we do it in public or not before  
9 public -- I tend to like before public comments for  
10 some like 5.71 and/or BTP 7-19, et cetera, as we went  
11 through that process, which we did, at least in my  
12 view, correctly.

13 So with that I just want to thank you all  
14 for a very, very good presentation. Love interchanges  
15 that get all the various viewpoints on the table and  
16 I think it's particularly important for the members of  
17 the Committee to hear the diverse views and thought  
18 processes that the I&C folks have on how they're doing  
19 their business. And I really do appreciate the input  
20 that you gave us on that.

21 So with that if there are any other  
22 comments from the Committee?

23 (No audible response.)

24 CHAIR BROWN: Hearing none, I will  
25 consider this meeting over, complete, whatever the

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1 process is, and thank you very much.

2 (Whereupon, the above-entitled matter went  
3 off the record at 12:48 p.m.)  
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# Periodic Update of Digital Instrumentation and Controls (DI&C) Infrastructure and Licensing Activities

## Digital I&C ACRS Subcommittee Meeting

September 22, 2021

**Eric Benner**, Director, Division of Engineering and External Hazards

**Jeanne Johnston**, Chief, Long-Term Operations and Modernization Branch

**Michael Waters**, Chief Instrumentation and Controls Branch

**Richard Stattel**, Sr. Electronics Engineer - Instrumentation and Controls Branch

# Purpose

**Purpose:** Brief Digital Instrumentation and Controls (DI&C) ACRS Subcommittee on the status of key Digital I&C Regulatory Activities

**Outcome:** ACRS Gains Better Understanding of Infrastructure and Licensing Activities Related to Digital I&C Topics

I&C = Instrumentation and Controls  
ACRS = Advisory Committee on Reactor Safeguards

# Agenda

- Opening Remarks
- Recent Guidance Updates
- Current Guidance Activities
- DI&C Licensing Activities
- Topical Reports
- Closing Comments

# Digital I&C Infrastructure Activities

Jeanne Johnston

# Removing Barriers for Digital Modifications under 50.59

- RIS 2002-22, Supplement 1, “Clarification on Endorsement of Nuclear Energy Institute Guidance in designing Digital Upgrades in Instrumentation and Controls Systems”
- RG 1.187 Revision 3, added clarifications in response to post-promulgation comments
- Regional Inspector Training
- Proposed Digital OpE Smart Sample for Inspectors

RG 1.187 - “Guidance for Implementation of 10 CFR 50.59, Changes, Tests, and Experiments”

RIS = Regulatory Issue Summary

RG = Regulatory Guide

5 OpE = Operational Experience

# Licensing Process for Digital Modifications

- Alternate Review Process in DI&C ISG-06 Rev. 2, “Licensing Process” (2018) – Defines the review licensing process associated with DI&C modifications requiring a license amendment
- February 2021 workshop conducted to discuss use of ISG 06, Revision 2

ISG = Interim Staff Guidance

# Recent Guidance Updates Support Digital Upgrades

- Inspection Procedure (IP) 52003 – Digital I&C Modification Inspection
  - Supports Digital Modifications, including those made under the Alternate Review Process (ARP) in DI&C ISG-06 Revision 2
- BTP 7-19 Revision 8 issued January 2021
  - Staff will update this BTP to address lessons from upcoming licensing actions and attributes as recently directed by EDO

# Work Continues to Address Common Cause Failure

- NEI 20-07 – Guidance for Addressing Software Common Cause Failure (CCF) in high safety-significant safety-related DI&C Systems
  - Staff will need to evaluate if current CCF policy in SRM to SECY 93-087 needs to be updated before a potential endorsement
  - Next version of NEI 20-07 to be provided end of September 2021 to adopt a risk-informed approach

NEI = Nuclear Energy Institute

SRM to SECY = Staff Requirements Memorandum to Commission Paper

# Expanding Access to Digital Equipment through Commercial Grade Dedication (NEI 17-06)

- Provides guidance on using 3<sup>rd</sup> party certifications to support the evaluation of platform reliability aspects for commercial grade dedication (CGD) of digital equipment
- Version requesting endorsement submitted to NRC in February 2021
- Staff is within the process to endorse via a new regulatory guide

# Expanding Access to Digital Equipment through Commercial Grade Dedication (NEI 17-06)

- NRC endorsed EPRI TR 106439, “Guideline on Evaluation and Acceptance of Commercial Grade Digital Equipment for Nuclear Safety Applications,” in 1997
- Staff engaged with NEI to validate the process by which a 3<sup>rd</sup>-party certification organization becomes accredited

IEC = International Electrotechnical Commission Standard 61508-2010 (IEC 61508), “Functional safety of electrical / electronic / programmable electronic safety-related systems.”

EPRI = Electric Power Research Institute / TR - Topical Report

# Strategic Updates to Regulatory Guides Continue

## **RG 1.152 - (IEEE 7-4.3.2 from 2003 to 2016 Version)**

- Incorporate new guidance for Secure Development and Operational Environment (SDOE) and include clarification to address ACRS feedback on BTP 7-19 Rev 8
- Retire ISG 04 Highly Integrated Control Rooms and Digital Communication Systems
- Include reference to RG 5.71 for cyber security and clarify uni-directional communication guidance

## **RG 1.168 - (IEEE 1012 2004 to 2016 Version)**

- Considering adopting the graded approach alternatives for the specified software integrity level (SIL) guidance
- Assessing feasibility of consolidating software criteria in RG 1.168, RG 1.169, 1.170, RG 1.171, RG 1.172, RG 1.173

RG = Regulatory Guides

BTP = Branch Technical Position

# Modernizing the Standard Review Plan

Current State of Chapter 7, "Instrumentation and Controls" Standard Review Plan	Desired State of Chapter 7, "Instrumentation and Controls" Standard Review Plan
System specific review guidance	Safety focused and requirement specific review guidance
Repetitive – Several topics are covered in multiple areas of the SRP	Streamlined approach - Topics covered in one area of the SRP
8 System specific sections	5 Sections – focused on safety and regulatory requirements for I&C systems
4 Appendices	Appendices content transferred to regulatory requirement sections
17 BTPs	4 BTPs - 13 BTPs deleted, system specific content transferred to I&C system review guide
No consideration of the DSRS or DRG	Takes into consideration prior work of DSRS & DRG

**SRP** = Standard Review plan

**BTP** = Branch Technical Position

**DSRS** = Design Specific Review Standard

**DRG** = Design Review Guide

# DI&C Licensing Activities

Michael Waters

# Waterford Core Protection Calculator System (CPCS) LAR

- Upgrade the existing digital CPCS to a Westinghouse Common Q based CPCS
- LA approval issued on August 24, 2021
- First use of ISG-06 "Alternate Review Process"
  - Design Requirements and Architecture
  - Fundamental Design Principles (e.g., Diversity and Defense in Depth)
  - Vendor Oversight Plan and Software Development Plans
- Staff applying ARP Lessons to upcoming Turkey Point and Limerick LARs

LAR = License Amendment Request  
Common Q = Common Qualified Platform  
TS = Technical Specifications  
ARP = Alternate Review Process

# DI&C ISG-06 Lessons

- Highlights -

- Scope of Vendor Oversight Plan
- Crediting Self-Diagnostics
- Supplemental Basis EQ Test Results
- Integrated Review Team & Use of Risk Insights
- Use of Open Item Process
- Implementation of Licensing Review & Audits, Vendor Inspections, and Regional Inspections

# Turkey Point Digital Upgrade

- Replacement of RPS, ESFAS, & NIS
  - Credit for self-diagnostics to eliminate channel surveillance tests
  - Diverse actuation system for certain functions
  - Credit leak before break detection in diversity and defense-in-depth assessment
  - Plant Installation in Spring 2023 for Unit 3 and Fall 2023 for Unit 4
- FPL intends to submit application in September 2021
- Staff will use ISG-06 Rev. 2 and BTP 7-19 Rev. 8

**RPS** = Reactor Protection System

**ESFAS** = Engineered Safety Features Actuation System

**NIS** = Nuclear Instrumentation System

**FPL** = Florida Power and Light – A division of NextEra Energy

# Limerick Digital Upgrade

- Replacement and integration of RPS, NSSSS, and ECCS into new system called PPS
  - Exelon partnership with DOE Light Water Reactor Sustainability Program
  - Installation in 2024 for Unit 1 and 2025 for Unit 2
- Exelon intends to submit application by September 2022
- Staff will use ISG-06 Rev. 2 and BTP 7-19 Rev. 8

DOE = Department of Energy

RPS = Reactor Protection System

NSSSS = Nuclear Steam Supply Shutoff System

ECCS = Emergency Core Cooling System

PPS = Plant Protection System

# SHINE Operating License

- Integrated digital instrumentation and control systems
  - Highly Integrated Process Instrumentation Controls System (PICS)
  - Target Solution Vessel Reactivity Protection System (TRPS)
  - Engineered Safety Features Actuation System (ESFAS)
  - Radiation Monitoring System (RMS)
  - Neutron Flux Detection System (NFDS)
- Staff using review guidance in NUREG-1537

**NUREG 1537** - "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors"

# AFRRI System Upgrade

- Replacement of TRIGA reactor control system, reactor protection system, nuclear instrumentation, and control console
- Hybrid analog and digital system to control and protect the reactor
- Staff using review guidance in NUREG-1537
- Staff intends to issue license decision in 2022

**AFRRI** = Armed Forces Radiobiology Research Institute

**TRIGA** = Training, Research, Isotopes, General Atomics

# DI&C Topical Reports

Richard Stattel

# HFC

- Generic FPGA based Digital System Platform
- Topical Report Approved in June 2021
- Platform Features
  - FPGA Based
  - Builds upon previously approved HFC-6000

**HFC** = HF Controls, subsidiary of Doosan

**FPGA** =Field Programmable Gate Array

# Westinghouse Self Diagnostic Topical

- Common Q Platform and Component Interface Module (CIM) System Elimination of Technical Specification Surveillance Requirements
- Topical Report approved December 2020
- Topical Report Features
  - Applies to Westinghouse Common Q platform-based systems
  - Approves a process that can be used to credit Common Q self-diagnostics features as a basis for eliminating SRs for Common Q based safety systems
  - Process was applied and has been approved for the Waterford Core Protection Calculator License Amendment

**CIM System** = System providing the interface between the safety system and the plant components it controls

**Common Q** = Common Qualified Platform

**SR** = Surveillance Requirements

# AMS Online Monitoring

- Online Monitoring Technology to Extend Calibration Intervals of Nuclear Plant Pressure Transmitters
- Safety Evaluation completed in August 2021
- Topical Report Features
  - Provides method that licensees can use to perform on-line monitoring of pressure transmitters to extend or defer calibrations
  - Method includes processes for monitoring transmitter time response characteristics

# Holtec SMR-160 I&C Topical

- Topical Report Employing the Mitsubishi Electric MELTAC Technology for the SMR-160 Instrumentation and Controls
- MELTAC Topical Report approved in May 2019
  - Uses computer microprocessor and FPGA based programmable logic controller (PLC) technology
  - Consists of pre-defined set of hardware and software components developed specifically for nuclear applications.

**MELTAC**= Mitsubishi Electric Total Advanced Controller

**SMR** = Small Modular Reactor

**FPGA** =Field Programmable Gate Array

# Closing Remarks