Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee of Reactor Safeguards Digital Instrumentation and Control and Electrical Systems Subcommittee

Docket Number: (n/a)

Location: teleconference

Date: Thursday, June 27, 2024

Work Order No.: NRC-2916 Pages 1-249

NEAL R. GROSS AND CO., INC.
Court Reporters and Transcribers
1716 14th Street, N.W.
Washington, D.C. 20009
(202) 234-4433

1
2
3
4 DISCLAIMER
5
6
7 UNITED STATES NUCLEAR REGULATORY COMMISSION'S
8 ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
9
10
11 The contents of this transcript of the
12 proceeding of the United States Nuclear Regulatory
13 Commission Advisory Committee on Reactor Safeguards,
14 as reported herein, is a record of the discussions
15 recorded at the meeting.
16
17 This transcript has not been reviewed,
18 corrected, and edited, and it may contain
19 inaccuracies.
20
21
22
23

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

+ + + + +

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

DIGITAL I&C SUBCOMMITTEE

+ + + + +

THURSDAY

JUNE 27, 2024

+ + + + +

The Subcommittee met via Video-Teleconference, at 8:30 a.m. EDT, Thomas E. Roberts, Chairman, presiding.

SUBCOMMITTEE MEMBERS:

THOMAS E. ROBERTS, Chairman

VICKI M. BIER, Member

VESNA B. DIMITRIJEVIC, Member

GREGORY H. HALNON, Member

WALTER L. KIRCHNER, Member

DAVID A. PETTI, Member

MATTHEW W. SUNSERI, Member

ACRS CONSULTANTS:

DENNIS C. BLEY

CHARLES H. BROWN, JR.

MYRON HECHT

STEPHEN P. SCHULTZ

DESIGNATED FEDERAL OFFICIAL:

CHRISTINA ANTONESCU

ALSO PRESENT:

JOSEPH M. ASHCRAFT, NRR/DEX/EICB

SUSHIL K. BIRLA, RES/DE

ALAN CAMPBELL, Nuclear Energy Institute

NORBERT N. CARTE, NRR/DEX/EICB

SAMIR X. DARBALI, NRR/DEX/ELTB

MICHAEL L. MARSHALL, JR., NRR/DORL/LPL1

TANIA MARTINEZ NAVEDO, NRR/DEX

SCOTT W. MOORE, ACRS

JASON C. PAIGE, NRR/DEX/ELTB

WILLIAM A. ROGGENBRODT, NRR/DEX/EICB

FANTA X. SACKO, NRR/DEX/EICB

DINESH X. TANEJA, NRR/DEX/ELTB

CONTENTS

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

8:30 a.m.

CHAIR ROBERTS: Good morning. This meeting will now come to order. This is a meeting of the Advisory Committee of Reactor Safeguards, the Digital Instrumentation and Control and Electrical Systems Subcommittee, which we'll call the Digital I&C Subcommittee.

I am Tom Roberts, chair for this meeting. Members in attendance in the room today are Bob Martin, Dave Petti, and online, we have -- if I miss somebody, let me know -- but Greg Halnon, Matt Sunseri, Vesna Dimitrijevic, Vicki Bier.

Is Craig Harrington on?

MEMBER KIRCHNER: Tom, this is Walt. I'm here as well.

CHAIR ROBERTS: Okay. And Walt Kirchner.

Thank you, Walt.

Is Craig Harrington on the line?

Okay. And, Ron Ballinger, are you online?

Okay. That's, I believe, a complete list. And we also have in the room our consultants Charlie Brown and Steve Schultz.

And is Dennis online? We expect Dennis Bley.

DR. BLEY: Yes, I'm on.

CHAIR ROBERTS: Okay, Dennis is online. So, Dennis Bley.

MR. HECHT: Yes, Chairman, Myron Hecht, a consultant.

CHAIR ROBERTS: All right. Myron Hecht, also a consultant. So, we have a full slate of consultants this morning.

Christina Antonescu is the Designated Federal Officer for this meeting.

Today, the NRR staff is going to present an overview of work they are doing in support of digital I&C regulatory activities. The overview is for the information of the Subcommittee, but we expect the information presented to inform further future ACRS reviews.

The staff provides updates of the Digital I&C Program, and the last update was presented in September of 2021. Since this last update nearly three years ago, we have had some changes in ACRS membership and there have been changes in NRC staff management in the digital I&C area. So, this interchange is timely and should benefit all of us.

I'll talk more at the end of these opening remarks about what are the Committee personnel changes

1 affecting this Subcommittee.

2 The ACRS was established by statute and

3 it's governed by the Federal Advisory Committee Act,

4 FACA. The NRC implements FACA in accordance with its

5 regulations found in Title 10 of the Code of Federal

6 Regulations, Part 7.

7 Per these regulations, the Committee can

8 only speak through its published Letter Reports. We

9 hold meetings to gather information and perform

10 preparatory work that will support our deliberations

11 at a full Committee meeting.

12 Since today's meeting is intended to be an

13 information briefing by the staff, we do not expect to

14 prepare a letter at the full Committee meeting and all

15 member comments should be regarded as the opinion of

16 that member, not a Committee position.

17 The rules for participation in all ACRS

18 meetings were previously announced in The Federal

19 Register.

20 The ACRS section of the U.S. NRC public

21 website provides our charter, bylaws, agendas, letter

22 reports, and full transcripts of all full and

23 subcommittee meetings, including slides presented

24 here. The agenda for this meeting was posted there.

25 We and the staff do not expect to discuss

1 any proprietary or export-controlled information
2 today. So, the entire meeting will be open to the
3 public. So, that's kind of a caution and request for
4 the staff. If we start to go there, you know, I'll
5 stop the discussion. If we need to go to a closed
6 session, we will, but at least my intention is not to
7 do that today.
8 As said in The Federal Register Notice and
9 the public meeting notice posted at the website,
10 members of the public who desire to provide written or
11 oral input to the Subcommittee may do so. We have not
12 received any written input or advance request to make
13 oral statements from members of the public regarding
14 today's session. There will be an opportunity for
15 public comment and we have set aside time in the
16 agenda for comments from members of the public
17 listening to the meeting.
18 Today's meeting is being conducted as a
19 hybrid meeting with the participants both remote and
20 in our meeting room.
21 A transcript of this meeting is being kept
22 and will be made available on our website. Therefore,
23 we require staff and participants in this meeting to
24 identify themselves and speak with sufficient clarity
25 and volume, so that they can be readily heard.

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

We will take a short break after each presentation to allow time to adjust screen-sharing, if we need be, and we'll breaks during longer presentations at my discretion.

Based on experience from previous virtual or hybrid meetings, please do not use any virtual meeting feature to conduct sidebar discussions relating to the presentations. But, rather, limit use of the meeting chat to report IT problems, such as inability to hear or see the presentations.

Those on the MS Teams link or phone lines should mute themselves when not speaking. If you are in the room, please check to make sure your electronic devices are in a sound that will make sure we don't disrupt the meeting.

And before I turn this over to the NRC staff for their opening remarks, I want to note that I became the Chair of this Subcommittee about two months ago. My predecessor, Charlie Brown, led this Subcommittee for 15 years, until he retired as an ACRS member in April. By my count, he chaired 38 of the 51

meetings that the Subcommittee has held in its history, not counting today's.

His influence on the Subcommittee is seen in more than these numbers, but, rather, his legacy is in pushing the I&C system requirements and review approaches through underlying principles, such as redundancy, independence, defense-in-depth, and diversity, as well as behavior and control of access. I am fully aligned with tying the actual processes to principles. So, I really appreciate the legacy that Charlie is leaving.

Charlie, as people in the room can see, is here. He remains available to the Subcommittee as an ACRS consultant, and I look forward to continue to learn from him, as I have for over four decades of our professional relationship.

Does anyone else from the Committee want to make a comment?

MR. BROWN: Yes. He worked for me for 20 years before I left NR. So, he and I have worked together for a long time.

I was very, very enthusiastic and happy when he applied to the Committee because I think he brings a great deal of real breadth outside of the I&C world, since he was Director of Reactor Safety for --

I don't know; what? -- 10 years or something like that, 12 years, at NR. So, I think the combination of his previous experience, plus his reactor safety experience at Naval Reactors is going to be a valuable asset to the full Committee, and hopefully, to the staff, if you all will keep your ears open, like you did for me.

I much appreciated your all's assistance all through the 15-16 years. It was outstanding, to say the least. And we've really migrated to work on all the standards and Reg Guides and everything else for the architecture approach and principles approach of doing business. So, I'm very, very happy that Tom has taken over.

So, I'll shut up for a while.

CHAIR ROBERTS: Okay. Yes, thanks, Charlie.

So, anyway, with that, we'll now proceed with the meeting.

I'll call on Ms. Tania Martinez Navedo, who is the Acting Director of the Division of Engineering and External Hazards, or DEX, at the Office of Nuclear Reactor Regulation here, to make some welcoming remarks before we begin today.

Tania?

1 MS. MARTINEZ NAVEDO: Good morning. Thank
2 you, Member Roberts, and good morning, everyone.
3 Our purpose today is to brief the
4 Subcommittee on this --
5 CHAIR ROBERTS: Tania, can you pull the
6 mic closer to you?
7 MS. MARTINEZ NAVEDO: All right. I do.
8 Can you hear me now?
9 CHAIR ROBERTS: Sure.
10 MS. MARTINEZ NAVEDO: All right.
11 CHAIR ROBERTS: Yes.
12 MS. MARTINEZ NAVEDO: Thank you, Member
13 Roberts, and good morning, everyone.
14 Our purpose today is to brief the
15 Subcommittee on the status of various digital I&C
16 infrastructure, licensing, and research activities.
17 May we have the first slide, please?
18 The last time that we provided the
19 Subcommittee an overview of our digital I&C
20 infrastructure and licensing activities was on
21 September 22nd of 2021. We are well overdue to
22 provide that update discussion, and our intent is to
23 give the ACRS an understanding of the ongoing and
24 planned work and to help the Committee decide in which
25 activities your involvement would be beneficial.

1 It is important to understand that we have
2 completed our focused effort to modernize digital I&C
3 infrastructure and our focus has shifted to applying
4 the improved infrastructure in our ongoing in-plant
5 reviews.
6 The overview we present today will cover
7 most of the work we are currently doing or planning.
8 Some of the topics that we will cover today will be
9 covered in greater detail in later briefings to the
10 Subcommittee.
11 I will also note that some of the work we
12 are performing or planning are depending on factors
13 outside of our control. Therefore, the timing of the
14 work may change.
15 Next slide.
16 At the beginning of our presentation, we
17 will briefly cover some historical background to
18 provide context for our work. Prior to handing the
19 mic off, I would like to introduce the people that
20 will be presenting.
21 Jason Paige, who is the Chief of the Long-
22 Term Operations and Modernization Branch, will share
23 with you our coordination efforts with external
24 stakeholders.
25 Fanta Sacko, the Chief of the

1 Instrumentation and Controls Branch, will be providing
2 our closing remarks.
3 Dinesh Taneja, a Senior Electronics
4 Engineer, will discuss our advanced and new reactor
5 work.
6 William Roggenbrodt, an Electronics
7 Engineer, will provide a high-level overview of
8 operating reactor licensing and Topical Report
9 reviews.
10 And Samir Darbali, an Electronics
11 Engineer, will talk about regulatory infrastructure
12 and key research activities.
13 In addition to thanking the presenters for
14 the effort put into today's presentation, I would like
15 to thank the staff in NRR and Research that helped
16 prepare the presentation and prep those of us speaking
17 today for success.
18 Samir will start us off with some
19 background.
20 Next slide.
21 MR. DARBALI: Thank you, Tania, and good
22 morning, everybody.
23 So, we are on slide 4.
24 Back in early 2016, the Commission issued
25 SRM-SECY-15-0106, where it directed the staff to

1 develop an integrated strategy to modernize the I&C
2 regulatory infrastructure in a way that is
3 performance-based and technology-neutral.
4 In response to this SRM, the staff
5 proposed an Integrated Action Plan, or IAP, to
6 modernize the I&C regulatory infrastructure. The
7 Commission approved the implementation of the IAP in
8 SRM-SECY-16-0070.
9 The IAP had certain tactical and strategic
10 objectives. The tactical objectives focus on near-
11 term digital upgrades and on providing clarity,
12 support industry confidence, and reduce regulatory
13 uncertainty. The strategic objectives focus on the
14 broader modernization of the regulatory
15 infrastructure.
16 Next slide. We are on slide 5.
17 The IAP consisted of four harmonization
18 plans.
19 Modernization Plan 1 focused on
20 protections against common-cause failures.
21 Modernization Plan 2 focused on digital
22 modifications performed under 50.59.
23 Modernization Plan 3 focused on commercial
24 grade dedication and acceptance of digital equipment.
25 And Modernization Plan 4 focused on

1 modernizing the regulatory infrastructure.

2 The activities for These Modernization

3 Plans were selected by engaging with stakeholders to

4 identify common priorities, problems, and potential

5 solutions to address them. All of these activities

6 under the IAP Modernization Plans have been completed.

7 Next slide. We're on slide 6.

8 In late 2019, the staff issued SECY-19-

9 0112, where it reinforces the vision for a modernized

10 I&C regulatory infrastructure that is clear and would

11 reduce regulatory uncertainty in order to enable the

12 expanded use of digital I&C technology in commercial

13 reactors, while continuing to ensure safety and

14 security.

15 The staff's regulatory infrastructure

16 modernization effort to support licensing applications

17 is complete, and as Tania mentioned, the staff

18 continues to make improvements under our normal

19 processes.

20 CHAIR ROBERTS: Samir, I'm trying to

21 integrate these three slides. And the first of the

22 three says that you have a strategic and a tactical

23 vision. And the tactical vision I think is pretty

24 clear, which is to support whatever applications come

25 in in a timely way and do quality reviews, and all

1 that.

2 The strategic part is not as clear to me.

3 What this slide now seems to say is you had a goal and

4 you achieved it. And so, the implication is that you

5 only have the tactical objective; that there is no

6 remaining strategic objective.

7 And going through the rest of these

8 slides, I can derive several things that seem like

9 strategic objectives. I was wondering if you've got

10 a roll-up of what you're driving to, what is currently

11 driving you behind the tactical in terms of what

12 you're trying to achieve.

13 MR. DARBALI: Right. So --

14 CHAIR ROBERTS: And I'm willing to defer

15 this to the end, if you would like, if there's some

16 benefit to hearing some of the details before getting

17 there, but I just wanted to at least state the

18 question and see if you've got a quick answer, and if

19 you have something that you could point to, to say,

20 "This is our current strategic vision."

21 MR. DARBALI: So, back in 2019, there was

22 a report for the strategic assessment of the I&C

23 regulatory infrastructure and that laid out some of

24 the considerations or ideas for future improvements

25 that we can do under our regular processes. But, as

1 you will see throughout the slides, that identifies
2 those approaches to enhance and improve the
3 organization or the regulatory infrastructure.
4 CHAIR ROBERTS: Yes, so maybe we'll just
5 put a hook in this one and come back, and then, go
6 back to it in the end.
7 To tee up an example, there's a lot of
8 work on hazards assessment approaches. There's the
9 STPA work. There's a research study you did to update
10 a 2025, I think it was, research letter that gave you
11 some more guidance on how to do a hazards test.
12 And so, it seemed like there is a vision
13 of we can make things better from a regulatory
14 infrastructure perspective by having a more commonly
15 understood approach to what's an adequate hazards
16 assessment. And again, that would seem like a
17 strategic goal, but I haven't seen it written down as
18 such or tied to what you're trying to achieve with it.
19 And there are a couple of other things
20 like that that are in that category that might
21 constitute a strategic view or goal or vision,
22 whatever you call it. But just, again, we can come
23 back to that, but that's the kind of thing I'm looking
24 for.
25 You do seem to be working more than just

1 the tactical. I just can't tell whether you've got it
2 planned or whether you've got kind of a vision that
3 connects it all.
4 MR. DARBALI: Okay.
5 CHAIR ROBERTS: Okay. Thanks.
6 MR. TANEJA: This is Dinesh Taneja.
7 Basically, we engage the stakeholder when
8 we develop these MPs, what we call them. So, MP4 was
9 the visionary.
10 Now, my really issue right now is, really,
11 we are relying on the industry to provide what they
12 want to do, so we can prepare ourselves accordingly.
13 Right? So far, what we have produced, you know, like
14 ISG-06, we only had one pilot and one is in the works.
15 Right?
16 So, we want to see some feedback as to,
17 you know, our modernization effort is in line with
18 what the industry wants and where they want to go.
19 And we are continually engaging with them to see how
20 they want to proceed, so we can align ourselves up
21 with that.
22 And our research plan is aligned with
23 those activities. And I think that's where we left
24 off with this MP4 on the visionary plan and how to
25 proceed further, and made it part of our, I would say,

1 day-to-day work, part of our regular routine.
2 That's why I think we say, you know, we
3 are done with setting it all up, and now, we have the
4 plan; we are executing it.
5 CHAIR ROBERTS: Sure. And the first sub-
6 bullet on this slide is a pretty good statement. It's
7 awfully general, but it's a good statement. And I
8 think that the second bullet is a little bit
9 contradictory to it maybe.
10 And again, I think what you're saying is
11 that, in achieving that division stated there, you're
12 getting feedback from real-world projects and feedback
13 from folks who are trying to get new designs,
14 improvements, whatever, through the regulatory
15 process. And if they come up with problem statements
16 or ideas, then that's something that you will, then,
17 pursue. And maybe that's a way to describe it.
18 MR. TANEJA: Yes. I mean, you know, it's
19 like we are getting challenged by some of the new
20 reactor vendors and their approach is to address same.
21 You know, we are doing business, but we cannot be just
22 -- you know, we have to be flexible and adapt
23 ourselves to see what kinds of challenges come in
24 front of us and be prepared.
25 Like you pointed out, hazard analysis, I

1 mean, we've hardly seen application of STPA by the
2 industry, I think except for one. NuScale did it.
3 Nobody else has really commented. I know it's being
4 used outside of the nuclear industry, that technique
5 of hazard analysis.
6 But we have been preparing ourselves, but
7 now we want to see if any other licensees or the
8 applicants are actually doing their hazard analysis
9 using some of these new tools.
10 That's really, you know, I think it's like
11 we don't want to put our focus into things that really
12 don't get used, and then, it is kind of resource
13 limitations drive that decisionmaking and all these
14 factors. It's just we want to be spending our time in
15 something that's tangible, you know.
16 CHAIR ROBERTS: Yes, that makes sense.
17 One of the hardest questions to answer in any area,
18 not just in I&C is, when have you done enough V&V?
19 So, if you haven't defined all the hazards
20 to the extent that you actually are very confident you
21 know what the hazard scenarios are and how you
22 mitigate them, then you really can't get there. And
23 so, I understand the connection there.
24 But again, we can come back to this. This
25 is a good discussion, but the whole idea of, what is

1 it that you say and what is it that your applicants
2 and licensees say, as these process improvements that
3 aren't necessarily done, like this slide says, but
4 it's the next level of now that you have the ISG-06
5 and some of this experience and risk-informed option
6 of BTP 7-19, those types of things, what's the next
7 step of how to facilitate both the application process
8 and your review?
9 MR. TANEJA: Right.
10 MEMBER MARTIN: I'm going to react to the
11 statement about kind of waiting for the industry.
12 When I started my career, you know, we were looking --
13 and I was industry -- looking at the NRC for certain
14 directions to guide how we created our methods to
15 respond to regulatory guidance or rules, specifically.
16 I would say, in the last 15 years, there's
17 been a shift kind of in the other direction, which led
18 to the comment you made about kind of wait and see
19 what industry does. And as a consequence, of course,
20 typically, led by NEI and that organization pulling
21 together experts and industry and drafting things that
22 they like or they can work with, and then, the NRC,
23 you know, looking over your shoulder and endorsing it.
24 I look at that as being kind of passive on
25 NRC's side. What I grew up with was NRC leading those

1 kinds of decisions. And I worked in industry. You
2 know, they're paying my retirement, that sort of
3 thing. I appreciate that world.
4 But, at the same time, as a person that
5 spent of the time on the staff level, I appreciated
6 having the explicit statements from leaders in the NRC
7 that understood the safety basis behind whatever
8 decisions were made and expressed that in Reg Guides
9 and NUREGs.
10 I feel like what you get from NEI is very
11 snapshot in time and maybe more specific, and not
12 necessarily capturing every aspect that has some
13 resilience through the march of time.
14 You know, the STPA, I know you all have
15 looked at for over decade. You know, I was looking at
16 some old transcripts and old documents. And there's
17 a lot of pluses to it and I'm a big advocate of
18 hazards analysis and would like to see a little bit
19 more of that across the board.
20 But, at the same time, something as
21 specific as STPA may not last in the next innovation.
22 You don't want to endorse something, only to see it
23 stagnate innovation. And so, that's why the regulator
24 needs to step back and at least holistically
25 understand what industry might be saying today, and

1 then, draft their own framework for how to go about
2 these things and create the Reg Guides as appropriate,
3 and maybe retire things that are not appropriate.
4 But again, my opinion, and as you said in
5 the preface to this meeting, that's all this is, is
6 our opinions. I am not a fan of endorsements. It's
7 a passive approach to safety and not a good look to
8 someone on the outside. So, consider it as an
9 opinion.
10 MR. TANEJA: I mean, you know, so where we
11 have the real use -- this is Dinesh Taneja. So, I
12 want to give a couple of examples of our proactive
13 activity. Right?
14 We develop, you know, for reviewing the
15 small modular reactors, the Design-Specific Review
16 Standard. I remember Member Brown really had a lot of
17 insights into how we went about it. But that was a
18 proactive move on the part of the NRC, developing that
19 review guidance, which really resulted in a very
20 clear, concise direction to the industry on how we
21 want to do business moving forward.
22 We proactively developed the Design Review
23 Guide for non-light water reactors. That's proactive
24 activities, right? And, you know, I think those are
25 being embraced very well by the industry.

1 But, then, there are certain things that
2 we see kind of dying, you know, before they really
3 even see the maturity or the applications. Under MP3,
4 we issued Reg Guide 1.250. Nobody from the industry
5 has stepped up so far as a user of that Reg Guide.
6 I mean, we all thought that that was a
7 very good process to allow using certified digital
8 equipment being commercially dedicated. And there is
9 a lot of certified equipment that's out in the
10 industry that could very easily translate into the
11 nuclear sector, right? But I don't know what the
12 holdups are.
13 So, it's like, you know, how do you really
14 do -- now, I look back and I say, you know, I spent
15 three years on that. Was it worth it? Or should I
16 have done something different? Right?
17 MEMBER MARTIN: It took us 30 years to
18 license a plan under Part 52, but I think, you know --
19 MR. TANEJA: Yes.
20 MEMBER MARTIN: -- at least we finally
21 did. There are other factors that play into whether
22 people use the work, and a lot of it depends on how
23 healthy the industry is.
24 But, I mean, I am reacting not just to
25 this situation, and I see, of course, the reference to

1 NEI 20-07, but across the board there has been a lot
2 of these endorsements of NEI or EPRI. And I worry
3 that it gives this impression that maybe industry is
4 leading too much; that there is not more of the
5 collaboration, more of the ownership of process that
6 I think really the NRC should lead on.
7 But I'm being a little philosophical. So,
8 I'll let you have your meeting back.
9 MEMBER HALNON: Hey, Tom, this is Greg.
10 Can I ask a question real quick?
11 CHAIR ROBERTS: Go ahead, Greg.
12 MEMBER HALNON: Yes, hey, one of the basic
13 premises of the SECY there on the screen is that there
14 were some projects that were coming down the pike from
15 a couple of existing light water plants, and they were
16 -- oh, I guess the staff was hoping to get some
17 lessons learned out of there and to continue the
18 development of improvement actions.
19 The first question is -- and let me finish
20 asking all the questions first -- the first question
21 is, did those projects come to fruition? And I
22 realize that we went through a COVID period at that
23 point, too.
24 The second question is, given the advanced
25 reactor utilization of digital I&C, and not just in

the basic infrastructure, but also in the control room and possibly beyond, is the staff considering keeping a core team of folks, experts, looking at continuing to expand the guidance or maybe massage the guidance?

And then, the third question is, has the staff asked the industry why they're not using the Reg Guide? What are the reasons for it? And maybe we can fix that.

MR. DARBALI: So --

MEMBER HALNON: Go ahead. There were three questions in there, and I probably won't remember how to reiterate them. So, hopefully, you wrote them down.

MR. DARBALI: So, this is Samir Darbali. I'll take a crack at the first question. I'll turn it over to Dinesh for the advanced reactor question, and then, the question on Reg Guide 1.250.

But the first question is, have we had any licensing applications using the existing framework and the work that we did under the IAP? So, for ISG-06, we had Waterford was the corporate leader for digital modification. So, we had that. That was a successful review and use of the ISG-06 alternate review process. And we got lessons learned from that that we are applying currently in the Limerick digital

upgrade license amendment review. So, we are working on that.

On the broader question, "Do we have a core team looking at improvements and applying lessons learned?" we do. And I think the staff working on licensing reviews for operating reactors and advanced reactors, we are also part of the industry standards development organizations. So, we are working with industry identifying lessons learned, identifying where improvements can be made, and identifying challenges. Right.

So, we are constantly in that process of guiding lessons learned, looking for improvement. And again, it's the staff involved in the license review, and it's also involved with industry in those efforts.

But I'll turn it over to Dinesh.

DR. BLEY: Yes, Dinesh, this is Dennis Bley.

MEMBER HALNON: Hold on, Dennis. There's one more question they have to answer.

DR. BLEY: Oh, I'm sorry.

MEMBER HALNON: It was whether or not they've asked and understand why the industry is not using the Reg Guide.

MR. TANEJA: You know, I don't know if we

1 can force the industry to do something.

2 MEMBER HALNON: Well, I'm not talking

3 about forcing. I'm just wondering whether --

4 MR. TANEJA: Right. You know, we

5 periodically engage with the NEI digital I&C Working

6 Group, you know, members of the NEI. We meet with

7 them every other week and these things are on the

8 list. And we are, basically, trying to get that

9 feedback from them as to where the industry is going.

10 So, that is our effort of staying connected with them.

11 And, you know, there are some questions

12 that come. Right now, we are getting some questions

13 on, are the IEEE standards risk-informed? And some of

14 these standards are very light-water-centric. So, we

15 are getting some examples out of them.

16 And so, yes, we are kind of looking

17 forward on all these issues and we are working. And

18 like Samir said, we are also proactively engaged with

19 the standard-development organizations. I personally

20 go to ISA meetings. I'm a voting member there, and

21 I'm also a voting member of the Software Subcommittee

22 QA and QA1 Subcommittee.

23 So, you know, we are staying engaged in

24 many different ways. So, I think that's the effort

25 that we are making.

1 Now, there may be other factors. I don't
2 know if there are economic factors or what the
3 operating reactor community is doing at this moment.
4 Advanced reactors, you know, we are really in a lot of
5 early stages. So, we haven't really seen anything
6 being built or put into practice other than I think we
7 had the platform Topical Report that we evaluated. We
8 were able to witness the prototype testing of that
9 one. We've seen some of those things, but nobody has
10 really applied it.
11 MEMBER HALNON: Yes. Okay.
12 MR. TANEJA: There are plants that think
13 that they are going to go that route. They may stay
14 with it; they may not stay with it.
15 So, I think, you know, doing our part now.
16 Industry, you know, whenever I think whatever the
17 limitations are, I can't answer for them.
18 MEMBER HALNON: Okay. Well, thanks,
19 Dinesh. I think it's important that we try to
20 understand that.
21 I know that there's another Reg Guide for
22 cybersecurity that the staff and the ACRS have put a
23 tremendous amount of time in, both writing it and
24 reviewing it. And when it came through the ACRS last
25 time, nobody in the industry was using it, because

1 they're all using an NEI document that was previously
2 endorsed.
3 So, we sort of understood why -- I think
4 it's 5.69 -- it was not being used. But, on this one,
5 it doesn't sound like we really have a good
6 understanding of why. And as soon as we understand
7 that "why," maybe we can understand better what
8 improvements we can make to open the floodgates, if
9 you will. That may be an overstatement, but, anyway,
10 that's my thoughts.
11 I'll turn it back over to Dennis. It
12 looks like he's waiting for a question.
13 Go ahead, Dennis. I'm done.
14 DR. BLEY: Okay. Thanks, Greg.
15 I just wanted to make a couple of comments
16 because I think this discussion may have left the
17 impression on the listeners that I don't think is
18 true.
19 This digital I&C area goes back many years
20 with people trying to bring in new systems and saying
21 they're much better. And there was a lot of evidence
22 that in process industries they have really made great
23 improvements.
24 NRC was being careful because of worrying
25 about the small chance of something going wrong and

1 how that could be coupled through these kinds of
2 systems. Despite all the bickering that's gone on
3 over the years, when Charlie and I first joined the
4 Committee, there was a very large effort of working
5 groups, involving both people from the industry side
6 of things and people from the NRC, that eventually led
7 to a series of guidance documents that were very
8 important in moving this process along.
9 The idea that the NRC is just
10 rubberstamping industry efforts by endorsing standards
11 to me is another wrong impression. There's a
12 government-wide effort to try to use consensus
13 standards wherever possible. The Commission has
14 backed this.
15 But these things aren't coming from the
16 potential licensee saying, "Here's how I want you to
17 regulate me." The NRC has been heavily involved in
18 the development of all of those standards. And when
19 they endorse, they often endorse with exceptions or
20 with additions for areas where they didn't think their
21 standards covered things that were very important to
22 safety.
23 So, I think the effort to use consensus
24 standards wherever possible is one that has involved
25 the regulator a great deal in the development of them.

1 So, I just wanted to get that in.

2 CHAIR ROBERTS: Okay. Thanks.

3 MEMBER KIRCHNER: Tom this is Walt.

4 If I might just affirm what Dennis was

5 saying and point out that many of these, whether it's

6 the ASME in the Boiler and Pressure Vessel Code or

7 IEEE, the NRC staff is regularly and intimately

8 involved in those standards committees. So, they are

9 a contributor. It's not a rubberstamp.

10 And so, thank you for that comment,

11 Dennis.

12 CHAIR ROBERTS: Yes, I'll say to Charlie

13 that the history in these slides goes back to 2015,

14 which probably didn't really accurately portray what

15 the journey is that the NRC has done. And I was going

16 to say it goes back to the late '80s. So, a lot of

17 effort during the new advanced light water reactors

18 involvement in the late '80s and early '90s, trying to

19 figure out what the best approach is. So, there's

20 been quite a journey, a lot more than the seven or

21 eight years showing up in these slides.

22 So, I think Dennis captured it real well,

23 that there is a lot more in terms of -- and maybe the

24 strategic view has in some ways stayed the same and in

25 some ways it's shifted quite a bit over the years.

1 In terms of the question that I started
2 this whole discussion with, it was to suggest keeping
3 an eye out on, okay, what is the next element of the
4 strategic vision that you ought to be practicably
5 working, more than just responding to what the
6 applicants are asking for?
7 So, with that, I'll turn to Charlie.
8 MR. BROWN: Yes. I just couldn't resist
9 chiming in on this. Because in May of 2008, or even
10 subsequent to that, when I first got here -- and
11 Dennis was a little bit ahead of me -- and we did our
12 first review, we were struggling, the Committee was,
13 how do we in the limited time that we have -- which
14 we're talking a few days to review information that's
15 coming in -- assess and determine is that okay? Can
16 we put the Betty Crocker Good Housekeeping Seal of
17 Approval on this, on what's being proposed and what
18 the staff is approving?
19 And I remember very clearly the first
20 meeting I got into where the vendor clearly went
21 through and said, "We will meet every standard. We
22 will do every position. We will comply with
23 everything and every IEEE standard that's out there."
24 And I asked the question about, in the
25 one-line diagram that looked like a stick man with no

1 hair on it -- I looked, and I'm not criticizing
2 anybody, but at that point the staff was kind of
3 logjammed because the vendor said that he would meet
4 all of the requirements. How can you say no?
5 I'm trying to remember what this Safety
6 Evaluation looked like. It was huge and it was
7 talking about all these little-piece parts. And
8 that's when we, the Committee, tried to move towards
9 -- which I viewed as a bottom-up review of what the
10 design looks like. I'm going to look at all the
11 pebbles on the beach and see if I can really say this
12 is a beach or not. Is it sand? Is it pebbles? Is it
13 nasty? Has it got sharp -- you just can't define it
14 well enough if you do that.
15 So, we decided -- I think the Committee
16 agreed that we ought to take a more top-down approach,
17 and that's where the fundamentals came in. And it's
18 interesting that you already had, based on
19 10 CFR 50.55a(h) -- 690, what is it, 1961? It's 603,
20 1991, I guess. It really had all the components that
21 we needed, but it doesn't have all these little-piece
22 parts in it. It's just the basic infrastructure from
23 what the systems ought to look like.
24 And so, we ran with that and the staff
25 acknowledged it. And we started moving towards a top-

1 down review of looking at, what are the important
2 characteristics that we need to be looking at, not all
3 the piece parts? What's the overall overarching
4 components that we need to look at?
5 And that is where, if you look at the SE
6 for the later ones, I mean, you can actually read them
7 and understand that, yeah, we're coming out in the
8 right place; we've met all these five principles.
9 And I echo a little bit of Robert's
10 comments around the endorsing of so many hazards
11 analyses standards and STPAs. I went back and
12 actually looked Leveson's stuff over the last couple
13 of days. I couldn't remember what STPA meant --
14 Systems-Theoretics, some type of other word salad that
15 goes along with it.
16 And all that stuff is very complicated,
17 and there's no way the NRC can sit there and
18 micromanage the details of all these various hazards
19 analyses. You've got to have an overall architecture
20 and structure that allows people to do reasonable
21 analyses -- FMEAs, whatever they want to call them --
22 and say, "That's enough because we've got boundary
23 conditions that are set up and allow us to proceed on
24 with the design and consider it to be acceptable, and
25 we're not uncomfortable with plants operating under

1 that." So, that was a great first step.

2 The other thing that the staff actually

3 commented on back in late 2008 that we migrated to was

4 ISG-06. And the vendors were complaining they didn't

5 know what to expect when they came in with their LAR,

6 License Amendment Request, or what have you.

7 And ISG-06 was an attempt to try to step

8 outside the box of everybody having to go through

9 5,000 concurrences to do anything and look to see

10 here's what we're expecting. And my feeling is that

11 the ISG-06 has worked fairly well in terms of prepping

12 the vendors or the applicants for knowing what the

13 staff is doing. So, they didn't get hit with stuff

14 coming out of right field on them.

15 And while I was reviewing your slides and

16 the other stuff, I started thinking about, is there

17 something else we're missing? I lost count of the

18 number of Reg Guides which we had modified to get the

19 architecture thought process -- most of them into that

20 process. But there are dozens of them. And there's

21 no way to maintain consistency between all of those

22 Reg Guides and all the IEEE standards at all times.

23 Is it time -- and I'm not saying stop; I'm

24 just saying throw this into your chili bowl of how can

25 you consolidate. The Design Review Guides are an

1 approach where you don't have all these
2 inconsistencies going from guide to guide, as they get
3 revised periodically and everybody has a new -- the
4 latest fad has to get cranked into the Reg Guide. So,
5 the Design Review Guides, to me, are a way to
6 consolidate in a way a guide -- a guide -- not a non-
7 light water guide and a light water guide; they look
8 the same. Okay? There is no reason to put different
9 labels on them. And then, consolidate critical pieces
10 of the Reg Guides into that Reg Guide, and then, can
11 all the Reg Guides.
12 Just thinking of the future, I just go
13 back to my past experience, and I guess Tom's as well,
14 when we were building stuff in other arenas. We had
15 a standards spec that we went out with. All the
16 standard requirements were in that spec. You just
17 didn't have to go out to the rest of the world.
18 Now, an equipment spec embodied that spec,
19 because ship designs change, and we had to accommodate
20 what the ship was going to look like and if they had
21 some different requirements.
22 But one thing to look at, I mean, I love
23 the Roadmap now that you all put together last year --
24 I think it was last year -- because it really kind of
25 put that in perspective. But I had to leave the

1 Committee.

2 (Laughter.)

3 MR. BROWN: So, this was an opportunity to

4 throw this little baby on the table and see, as it

5 floats around, to get into it. It seems to me we need

6 to get out of having so many different guidances out

7 there and so many hazards. I mean, the list of

8 different methodologies to go do hazards analysis is

9 as long as your arm.

10 And you just can't dictate that. You

11 can't manage that adequately. You've really got to

12 have the design come in where, regardless of what tool

13 they use, you've got boundary conditions on your

14 system that accommodate variations.

15 The architecture approach accommodates --

16 I'm not a big fan of -- we had a lot back and forth on

17 the SIL 1.250. That was laborious to get through

18 that, I agree with you, Dinesh.

19 But it was necessary to do that. It's a

20 matter of now how does it get integrated in, so that

21 you're not questioning everything they do. If you

22 start mouse milking everything they do relative to get

23 a SIL product in there, it's going to slow down the

24 whole process again. And you do not want that. You

25 do not.

1 You've got to be able to release it, and
2 the only way to release it is to ensure you have the
3 fundamentals and architecture that gives you
4 boundaries. And that includes -- one of the projects
5 that's in, they've got one communication path out of
6 all these plant things, plant systems, going through
7 one dedicated network with one path; no redundancy.
8 If it fails, the main control room is blank.
9 Well, that's a risk-informed issue? I'm
10 sorry, that, to me, at some point, that's where the
11 NRC should be paying attention. That's the boundary
12 conditions you need to be looking at, not how they
13 process the data through there. Some of it ought to
14 be one way. When you want to have switches operate,
15 it's got to be two way. But when you're going outside
16 the boundary conditions of the plant, it's got to be
17 one way, you know, in certain things.
18 And those are the things you look for.
19 You're not dictating, but you've got to ensure the
20 safe aspect of it. And you want to keep your hands
21 out of how they use these various pieces.
22 That's just a thought process. I thought
23 I'd get it out there, so you should use that. I put
24 that in your mind because you all are going to be
25 stymied trying to get through making sure they

1 implemented all these different things appropriately.
2 You don't have the staffing to do it and you've got to
3 build those boundary conditions in. And that's what
4 the Committee was trying to help you with over the
5 last 15 years.
6 So, all right, I'm done with my colloquy.
7 At least it's in the transcript.
8 CHAIR ROBERTS: Okay. Yes, thanks,
9 Charlie.
10 I'm thinking that those would be good
11 items to roll off at the end, when we look at what the
12 elements and the strategy are.
13 MR. BROWN: No one would remember this.
14 (Laughter.)
15 CHAIR ROBERTS: Well, I think we will;
16 it's in the transcript.
17 One thing that caught my attention in what
18 you just said is the consolidation of Reg Guides. And
19 they have a slide coming up on a series of Reg Guides
20 where they considered exactly that. And I think it's
21 exactly what we ought to talk about maybe later: is
22 that a broader concept? And maybe it would be more
23 strategic dealing with, okay, so 169 through 173 takes
24 five Reg Guides. And it's obvious, when you get to
25 water absorption, there's a different Reg Guide.

1 So, what's the next step of that? How
2 many other Reg Guides are comparable where you could
3 just put them under one umbrella and say, "References
4 A through Z are all endorsed with the following
5 exceptions or fabrications," and not have to go to so
6 many. So, I mean, I think it's a good point.
7 MEMBER KIRCHNER: Well, you've got BTP 7-
8 19. You've got 1.62, "Manual Actuation." He's
9 hitting the nail right on the head. You've got a
10 number of those that just ought to be brought
11 together, so that you can just say, "They're
12 cancelled. Here's the document." And that document
13 shouldn't be more than 30 or 40 pages. If it's 100
14 pages, kiss it off; you've lost the battle.
15 MR. PAIGE: This is Jason, sir. Do you
16 want to have that conversation now or table it?
17 CHAIR ROBERTS: I think we ought to move
18 on because a lot of the questions will get answered as
19 we go through the slides. And then, once everybody
20 has seen the materials that you're going to present,
21 then, I think we ought to wrap back around and see if
22 there's a strategic vision that you could either knit
23 together just from the discussions we've had today or
24 whether that's something that you would want to think
25 about going back and we'd have a future discussion on.

1 That's what I'm thinking. I think we've probably
2 touched on the major elements of what that strategic
3 vision might include.
4 MR. ROGGENBRODT: Good morning. This is
5 Bill Roggenbrodt.
6 And going back to your original question
7 about, you know, you saw the IAP and the MP4, and what
8 that looked like in regards to, you know, you see the
9 tactical, but not the strategic vision.
10 What I would offer is -- we've been
11 hearing that from other presenters -- is that combined
12 or instilled within Modernization Plans, which we took
13 input, recommendations from industry, and worked with
14 them in that regard, that's where MP 1 through 4 came
15 into existence, and items 1, 2, and 3 were managed as
16 it was done before, but within Modernization Plan 4 --
17 hence, the Modernization Plan -- was that strategic
18 vision to continue that dialog.
19 What Dinesh pointed out was, okay, there
20 is a periodic phone call with NEI to see what's going
21 on. To the other members' discussion about, "Well,
22 why aren't they using it," you know, are you asking a
23 negative of why they're not using Reg Guide 1.250?
24 I'm been on those calls, and usually, it's
25 not the "not discussion" that you're going for; it's,

"Okay, you're done with that. Now, we have something else for you." NEI 20-07 would be a good example and other items.

So, I would just offer that the strategic vision, it's going to be managed under normal processes, but that's, again, as a modern risk-informed regulator, that's part of our normal DNA now, as we've had to adapt and adjust over the past many years with that, and continue that going on.

So, I would see the strategic vision, you'll hear more about it, but it's also part of our DNA, if you will, that we have to move forward, and it's not something off to the side, or it's not something where there's a separate group of people. We all need to be thinking about that, as those items go through it.

And then, to the point that was made about working with industry or looking for endorsement of industry standards, there's also items that Samir will cover that you just pointed out that we'll go through that are in-house.

So, thank you.

CHAIR ROBERTS: Okay. Samir, are we still on you?

MR. DARBALI: Yes.

1 CHAIR ROBERTS: Okay.

2 MR. DARBALI: And just to add, all the
3 work we do is with industry -- industry input,
4 industry feedback. We have workshops. We're
5 involving the standards-development organizations.

6 When we say, you know, we completed a Reg
7 Guide or we haven't seen anything that industry is
8 proposing, yeah, that means we've haven't received an
9 application using the Reg Guide. I want to clarify
10 that doesn't mean that industry just saw the Reg Guide
11 and they didn't see a value in it. Industry does have
12 their own internal working groups and their own
13 activities to see how to implement the Reg Guide.

14 So, we don't want to give the impression
15 that industry is just not making use of the Reg Guide.
16 There's a lot of work they have to do internally for
17 them to implement that in their applications, and
18 then, come in for a License Amendment Request or any
19 other licensing action.

20 So, I guess we're ready to move on to
21 slide 7. Okay, 7.

22 So, this figure represents the staff's
23 major activities in the area of digital I&C. We've
24 broken them down into three major topics. And we've
25 got regulatory infrastructure modernization, licensing

and Topical Reports, and research activities. And we've talked, you know, at a high level on most of those. So, going forward in this presentation, we're going to dig down into those three major areas.

If there's no questions, we can go to slide 8.

So, we're going to start with regulatory infrastructure modernization. We're going to cover our activities on policy and rulemaking; guidance development, which includes industry guidance and staff guidance, and as well as generic communications.

Before we jump into the policy and rulemaking activities, we're going to revisit the overall I&C regulatory infrastructure or Roadmap that we have presented last year, just to give an overview of that work.

Slide 9. Thank you.

So, this and the following slides were presented to the Committee back in April of last year, when we gave a briefing on the topic.

At the top of the figure, we have the policy and regulatory requirements that drive the overall infrastructure.

On the bottom left, we have the regulatory guidance on how to meet those regulatory requirements.

1 And then, on the bottom right, we have our
2 staff guidance for performing licensing reviews. And
3 we're going to cover that in more detail on the next
4 slide.
5 Any questions on this slide?
6 CHAIR ROBERTS: I could ask it on this or
7 the next slide. The NUREG-1537 doesn't seem like it
8 fits where you have it there. And I took a look and
9 we just finished reviewing Kairos. I guess it's not
10 quite finished yet, but we had a meeting this week.
11 In their PSAR, they used the DSRS as their
12 guide to determine what the I&C is. Because NUREG-
13 1537 is probably -- what? -- 30 years old? And I
14 think it says "digital I&C" at one point, but,
15 clearly, there's a lot that's happened.
16 MR. DARBALI: Yes.
17 CHAIR ROBERTS: So, is that really the
18 right thing to reference here or are research and test
19 reactors, or non-power reactors rather, kind of stuck
20 going to fish for what the right document to be used?
21 MR. DARBALI: So, I believe 1537 is
22 currently going through a revision. I saw Norbert
23 Carte raise his hand and he's involved in that effort.
24 So, Norbert?
25 MR. CARTE: Yes. So, NUREG-1537 is

1 currently 1996. It exists in Part 1, which is,
2 effectively, regulatory guidance, and Part 2, which
3 is, effectively, SRP.
4 So, in power reactor space, we have Reg
5 Guide 1.70, Rev. 3, which was last updated in 1978.
6 But, in NPUFs, it's NUREG-1537, Part 1, is what to
7 submit. Part 2 is the SRP.
8 Yes, it's being updated. That update was
9 held because of the NPUF rule which just got approved.
10 So, that update is moving forward. That's now going
11 to be issued in five parts, four -- well, five
12 volumes, each with two parts. Four of those volumes
13 are addressed as specific reactor facility types, and
14 the fifth volume is --
15 DR. BLEY: Norbert, this is Dennis Bley.
16 MR. CARTE: Yes.
17 DR. BLEY: I was just trying to think
18 back. We had a couple of NPUF applications come
19 through, and the existing guidance didn't work so well
20 for them. So, the staff adopted several other things.
21 Can you be a reminder about that and those things that
22 I'm trying to remember being incorporated into the new
23 Rev of 1537?
24 MR. CARTE: Right. So, there were some
25 Chapter 7 -- I think they were Interim Staff Guidance.

1 So, there were some draft revisions, and that's what
2 was used in the past. And, yes, that's predominantly
3 getting updated, but the new update is at the whole
4 SRP rather than just Chapter 7.
5 DR. BLEY: Okay. Thanks.
6 CHAIR ROBERTS: Thanks, Norbert.
7 It sounds like the simple answer is this
8 slide will be correct once the update is done, but at
9 this point you have what you have, and at least in the
10 case of Kairos, they used the NuScale DSRS as
11 guidance.
12 It kind of ties to what Charlie said
13 earlier, which is, when you're developing your digital
14 I&C system for a plant, it doesn't really matter
15 what's inside of the plant. In many ways, it's still
16 the architecture is going to be similar.
17 And I didn't see any real problem with the
18 use of the DSRS for Kairos. It seemed to work fine.
19 That may lead to some consolidation maybe down the
20 road being more practical.
21 MR. CARTE: Well, yeah, the biggest
22 difference is, obviously, 50.34 says that, for light
23 water reactors of current design and location, large
24 lights, the GDC is the criteria. But it doesn't
25 specify what the design criteria are for other types

of facilities.

Now, we have a Reg Guide that does that, in part, for certain new reactor types. But NPUFs are different and they have a much reduced set of principal design criteria. And that has a lot of implications for the whole design of the facility.

So, in effect, if the facility looks a lot more like a power reactor and the design criteria are similar to a power reactor, then, power-reactor-like guidance is more appropriate. But if they have a significantly reduced set of design criteria because of, say, they're a cool reactor or a 5-watt reactor, then, a lot of the power reactor stuff doesn't fit so well.

DR. BLEY: Okay. Thanks, Norbert.

CHAIR ROBERTS: Someone wants to be noticed.

MR. ASHCRAFT: This is Joe Ashcraft. I can probably clear up some of this on the Kairos, why the DSRS was used.

So, when I got involved, the NUREG-1537, similar to the SRP, sort of lays out the whole plan or what's required. And it doesn't really talk about construction permits. And we haven't done construction permits for -- well, the last time I was

1 involved, that was on the other side of the fence and
2 I wasn't even part of the licensing.
3 So, when I got the Kairos review -- and
4 Charlie has grilled me enough. I've sat in many
5 meetings where he had a stick.
6 So, I brought in the DSRS to look at I&C
7 architecture. Because you can look at the
8 architecture and almost draw circles around where
9 there's going to be issues. In fact, one was noted.
10 In addition to that, they also used to do
11 Reg 1537, and I sort of picked out things that I felt
12 that they could provide at the CP, at least an
13 overview of it, not necessarily down to the design
14 details.
15 So, that's why you see in Kairos, and even
16 ACU, that we point to the DSRS, specifically, to look
17 at their I&C architecture and the general dependence,
18 redundancy; look at their communications, and overall,
19 just trying to get a good feel that they're on the
20 right path.
21 CHAIR ROBERTS: Thanks.
22 MR. DARBALI: Okay. So, we can go to
23 slide 10. That covers a bit more detail on what we
24 were just talking about.
25 But I think the point I want to make is

1 these documents are the ones that we, typically, use
2 for those particular applications. We've heard the
3 feedback that, you know, software is software; it
4 doesn't matter where you use it. You still need to
5 apply those fundamental design principles.
6 So, historically, we had Chapter 7 of the
7 SRP, and as needs came on for small modular reactors,
8 there was the need for staff guidance that was more
9 appropriate for that. So, the DSRS came about and we
10 needed guidance for non-light water reactors. And so,
11 the SRP and the DSRS didn't really meet that need.
12 So, the DRG came about, and then, for NPUFs, we have
13 that NUREG.
14 So, they've been developed for a specific
15 need in mind. It doesn't mean that those particular
16 documents cannot be applied to different types of
17 applications that they weren't intended to. And I
18 think, as has been mentioned, if the application
19 supports that licensing review document, then it can
20 be used.
21 MR. BROWN: Software is software.
22 I'm sorry, let me get closer. Thank you.
23 There's no way you all can ever validate
24 software in any way, shape, or form. All you can do
25 is ensure that they have a quality process in place;

1 that's it -- that nobody can get in and alter the
2 software, and that they comment it, so you know what
3 going on.
4 After that, what they do internally
5 doesn't matter. An exception or so. If you remember
6 the Common Q Program, it's highly interrupt-driven;
7 highly, highly interrupt-driven. And the problem with
8 those is you never know where you are in the program.
9 It's not very deterministic.
10 We asked the question about how much
11 application code could you put in. Nobody had any
12 idea. It turns out they were limited to no more than
13 70 percent of the sample time that they could occupy
14 with application code.
15 And we said, "Well, how do you know that's
16 okay?" Dead silence. Like a meeting later, they came
17 back and said they actually tested it and it turns out
18 70 percent is okay.
19 A later project came in and said, "We want
20 to go to 75." I'm remembering; I might be off on the
21 number a little bit. But they tested it and they
22 found that that was okay for their application.
23 That's a boundary condition. I'm using
24 that only as you can't waste -- I'm sorry, that's the
25 wrong word; you didn't hear me say that. Strike that.

1 (Laughter.)

2 MR. BROWN: You don't have the resources.

3 And so, software is, like somebody else said, is

4 software, and you've really got to put, again, a

5 package of boundary conditions on software that are

6 important to pay attention to.

7 The other stuff, I think that, also, one

8 of the other packages -- I mean, right now, if I look

9 through this, a half a dozen different computer-based

10 controllers -- with ALS, and this and that, and

11 everything else.

12 They do stuff internally that -- I read

13 one of them at one time, the Topical Report, and I

14 couldn't believe I was reading it. They were tripping

15 their stuff every 10 milliseconds, microseconds, or

16 something, to see if they had proper output.

17 Everything else stopped while they tripped to see if

18 the output was true. That's dumb. Okay? It's not

19 really very smart, and your software really occupies

20 that.

21 So, boundary conditions are important in

22 the software, not the details of the software. So, I

23 thought I'd throw that in just we don't waste a lot of

24 time with software.

25 Diversity will save your buns. It's very,

very important, whether it's multiple controllers, computer-based programmer devices, or in FPGAs, it's different FPGAs.

So, anyhow, I thought I'd throw that in just for fun.

MR. DARBALI: Thank you. We can go to Slide 11. So, last year, we presented this figure that identifies the nine technical areas for I&C, and each technical area has its own detail figure from the applicable documents.

As guidance documents get developed or revised, we are making updates to the detail figures and we're replacing the updated slides on the NRC's public website. So, since we did the briefing on April of last year, we've made a couple of updates, and you can see the latest version on our public website.

And in the next two slides, we're just going to show an example of two of those technical areas. We'll focus on that for safety systems and safety system programmable devices -- again, to show an example of those diagrams.

DR. BLEY: Excuse me, Samir. This is Dennis Bley again. I've kind of looked at your website a little bit and find it very informative.

Have you had any feedback from other parties about whether it's been useful for them or not?

MR. DARBALI: Well, I can say that industry has been very receptive of those diagrams. We've heard that in some of our interactions in standards development working group meetings. But, also, I believe that industry in their own training for industry participants on how to understand our regulatory infrastructure, they are using those diagrams. We are very pleased with that.

DR. BLEY: Okay. Thanks.

MR. PAIGE: May I just add one thing? So, this is Jason. Thank you.

So, to your point, Member Brown, regarding the inconsistencies between Reg Guides, so this Roadmap not only helps industry, but this also helps --

(Audio interference.)

MR. BROWN: Somebody else needs to mute their phone.

MR. PAIGE: Okay. But this Roadmap also helps us as we update our Regulatory Guides just to see the overlap. And when we're updating one Regulatory Guide, we can see the overlap with the other Regulatory Guides and make sure that the

1 information between the two documents is consistent.
2 So, this Roadmap is very beneficial for us, too,
3 internally. So, I just wanted to add that point.
4 CHAIR ROBERTS: I think I know the answer
5 to this question, but I'll ask it anyway. This
6 diagram implies that cybersecurity is completely
7 separable from safety. And it seems like that really
8 isn't the case. In reality, you've got some -- I know
9 Reg Guide 1.152 has some guidance on that. And so,
10 that's in your safety.
11 I just wanted to maybe note for the record
12 that there really is no independence between the two;
13 that you need to have control of access, as Charlie
14 would say, as an important aspect of the safety story,
15 not just the cyber story.
16 MR. PAIGE: Correct.
17 MR. BROWN: Now, I'm going to interrupt
18 again.
19 How many years did we fight trying to get
20 the people to recognize you had to evaluate your
21 communication devices which were part of the design?
22 And we kept being told, "Nope, that's a programmatic
23 issue under Parts 71 and 73, and therefore, we're
24 silent. Stay out of it. You can't say a word."
25 And we fought that battle for how many

1 years? The applicants actually complied, but they
2 recognized the need for heavy unidirectional-type
3 communications in critical circumstances. And they
4 were doing, based on staff and our input helping them
5 out to understand that they ought to do it, we finally
6 got it.
7 I thought in one of the Reg Guides now we
8 finally got a reference that said -- was it 1.152? --
9 that 5.71 is, can be used as acceptable methods for
10 whatever during the design. Because you can't wait
11 five years later and finally figure out that your
12 cybersecurity protection sucks. You've got to think
13 about it when you're doing the design, not
14 programmatically later.
15 CHAIR ROBERTS: I think it's coverage. If
16 you're updating this diagram, I think I heard you say
17 you're updating the diagram --
18 MR. BROWN: That's exactly what I'm
19 saying.
20 CHAIR ROBERTS: And there may be, you
21 know, a dotted line or something that may be useful to
22 draw, just to make clear that there is a necessary
23 aspect of control of access in safety.
24 MR. DARBALI: So, we'll take that
25 feedback.

1 What we have, when we develop the
2 diagrams, what we have, typically, said is these are
3 nine technical areas for I&C, and then, you really
4 need some explanation of why they're separate. And
5 the reason is you have eight tied to Parts 50 and 52
6 for safety, and you have the cybersecurity aspect for
7 tying back to Part 73, but they're all together part
8 of the overall I&C regulatory infrastructure.
9 MR. BROWN: Tom is really right; you ought
10 to have a dotted line on there. That would be just a
11 dotted line into the safety. It ought to be a little
12 dotted line that bypasses the circles and goes over
13 into the main center circle, because that's what we're
14 doing now.
15 MR. DARBALI: And that's good feedback.
16 So, we'll see, as we continue to make updates, but,
17 right, I mean, we recognize cybersecurity is part of
18 it. I think we'll see it in one of the detail slides.
19 We have secure development in our environment, which
20 is not the same --
21 MR. BROWN: That's in the vendor's
22 location.
23 MR. DARBALI: Right. But we recognize the
24 importance of cybersecurity in the overall I&C
25 infrastructure.

1 MR. TANEJA: Yes, I agree with that
2 dotted-line concept. Because, in practice, when we
3 are reviewing these applications on digital, our
4 colleagues over at NSIR, they get involved with us
5 during the review stage, even though they would be
6 responsible in the programmatic area down the road.
7 But we do interface with them very early on in this
8 process. So, that dotted line does make very good
9 sense.
10 MR. BROWN: That was a problem four or
11 five or six years ago.
12 MR. TANEJA: No longer.
13 MR. BROWN: No longer?
14 MR. TANEJA: Thank you.
15 MR. BROWN: Once we got the words fixed,
16 it helped.
17 MR. DARBALI: Thank you.
18 Next slide.
19 So, this is, again, one of the nine
20 diagrams that we have providing that detail guidance.
21 So, on the left side, we have the applicable
22 regulatory requirements. In the middle, we have the
23 applicable Regulatory Guides and any endorsed industry
24 standard, and then, on the right-hand side, we have
25 the applicable staff guidance documents, which

1 includes the SRP, the BTPs, and the ISGs.

2 And to echo what Jason was saying, this

3 helps the staff understand our framework. So, it's a

4 snapshot. But it doesn't mean that this is going to

5 be the way it's always going to be. So, it helps us

6 understand and map out all the interactions between

7 the documents and helps us identify where there's

8 overlap, and we can take advantage of consolidation.

9 DR. BLEY: This is Dennis again.

10 And I think I heard you're going to get to

11 this eventually today. For me, while this is very

12 helpful, it's still -- I hate to use the word -- "a

13 rat's nest" of things all together.

14 Is there a plan for how these are going to

15 get consolidated sometime in the future? And are we

16 thinking 5 years, 10 years, 50 years?

17 MR. PAIGE: So, this is Jason.

18 So, during the BTP discussion, I know this

19 question came up during that ACRS meeting and we

20 received a letter from ACRS on that specific topic.

21 So, we're actually providing or drafting,

22 talking internally, going to provide a response to

23 that question and come up with a detailed plan in

24 terms of addressing that specific question.

25 But we can talk about it more now or table

1 it for a later time during today's meeting.
2 DR. BLEY: No, if I'm going to be hearing
3 about sometime, I don't need to press you today.
4 MR. BROWN: My memory is that was a
5 question that we didn't get answered --
6 MR. HECHT: This is Myron.
7 MR. BROWN: -- when we issued that letter.
8 Isn't that correct? I mean, that was an open question
9 in our letter.
10 MR. PAIGE: Yes. Yes, that was an open
11 question in --
12 MR. BROWN: And we did not get a detailed
13 response on that at the time, if I remember correctly.
14 MR. PAIGE: Right.
15 MR. BROWN: It says a few words, but they
16 didn't say much.
17 MR. PAIGE: So, I would say that, you
18 know, that takes more of an internal coordination to
19 come up with a response --
20 MR. BROWN: Okay.
21 MR. PAIGE: -- to that question. Because
22 we need to coordinate with our friends in Research and
23 just have a discussion on the feasibility of being
24 able to consolidate the Regulatory Guides.
25 You know, our current belief is that this

1 Roadmap and how our infrastructure is laid out
2 provides the clarity for implementing the
3 infrastructure. So, for us to change it and to
4 consolidate Regulatory Guides, we do need to have an
5 internal discussion and analyze, will that improve the
6 clarity; will that improve the efficiency of
7 implementing the regulatory infrastructure?
8 CHAIR ROBERTS: Yes, I took it from what
9 you said, Jason, you don't want to talk today about
10 your response to the March ACRS letter on the BTP?
11 MR. PAIGE: I'll just say that we're
12 discussing it internally. So, I think the due date
13 for providing a response has been a couple of months
14 for providing a response to that letter, I think.
15 MR. MARSHALL: This is Michael Marshall.
16 I believe our response is due back to the
17 Committee through the EDO's office in October of this
18 year.
19 MR. PAIGE: Okay. Thank you.
20 MR. MOORE: This is Scott Moore.
21 If something's in process that they're
22 developing, it's probably not a good use of time
23 because management or anybody could change it along
24 the way. Other offices will have other views. So, if
25 it's being developed, they need to work that out.

1 CHAIR ROBERTS: Right, I think the letter
2 comment was specific to the DRG versus the BTP, and
3 one is three pages on D&D and the other one is 48, and
4 whether there's some commonality that could be struck
5 between the two to have the right level of detail.
6 But I think what we're talking about now
7 is a more general instance of that question which is
8 getting beyond BTP 7-19. You know, where does it make
9 sense to consolidate? And I'm not sure you have an
10 answer, even in the timeframe you're talking about,
11 because I know you're working this with the 168
12 through 173 series, and this is a more general
13 question of just staring at the screen: what would
14 make sense as an end state, and is there a 5-year, a
15 10-year, whatever, horizon to get there in terms of
16 prioritization of resources and figuring out where the
17 benefit is for what degree of consolidation?
18 So, just something to do, to take in mind
19 that, if you're in discussions on this, that maybe you
20 could also consider the more broad question and see if
21 there's some consensus; you have, again, a vision of
22 where you would like to take this.
23 You might be starting that with Reg Guides
24 168 to 173. So, it's just, again, there's a logical
25 next step on both the BTP question and what you're

1 already doing on that series.

2 So, again, just a thought.

3 DR. BLEY: This is Dennis again, since

4 I've got this one here.

5 I kind of want to withdraw my earlier

6 statement. This has helped me a great deal in

7 organizing my own thoughts about the process that you

8 guys are going through, and I find it very helpful.

9 Thanks.

10 CHAIR ROBERTS: Yes, I'll let Jason

11 respond first, and then, we'll go to Myron.

12 MR. PAIGE: Thank you.

13 Regarding the consolidation of BTP and

14 DRG, so we just issued Rev 9 of the BTP. So,

15 typically, we like to give it a little bit more

16 runtime, develop lessons learned, and then, we can

17 talk about next steps in terms of consolidation, or if

18 it makes sense to consolidate or not. But we would

19 like to get some runtime with it, just to gather those

20 lessons learned. So, I just wanted to add that piece

21 of it.

22 CHAIR ROBERTS: Certainly. I'm not going

23 to tell you what timeline and what you would do, or

24 what degree of consolidation will make sense. It's

25 just maybe to get that on the table as something, from

a strategic view, where does this fit into what you would like to work and what kind of end state would you envision, those kinds of things.

And I'm certainly not thinking you would have it done by the end of this calendar year or anytime -- you know, 5 to 10 years is probably a reasonable horizon for something like that.

Myron?

MR. HECHT: Yes, this is Myron Hecht. I just wanted to say something.

At the very end of this presentation, you have something about Model-Based Systems Engineering and you're going to be looking into that. And this is a classic example of how MBSE, or specifically, SysML requirements diagrams can be used for this.

Within the SysML requirements diagrams, you have relationships such as derive TRACE, verify. Within the requirements, you also have compartments not only for the text of the requirement, but also for rationale and additional fields that you can put in to provide history and provide other things.

Now, the point is that, with relationships between requirements, you can easily establish traceability of Staff Guidance to a Reg Guide to a regulation. And if things change, then, you know

1 through the relationships what the dependencies are
2 and what can be changed.
3 The SysML work, or the MBSE work that were
4 pointing out seems to look primarily at REEVES
5 (phonetic), but using SysML for this requirements
6 analysis, I think it will take you a very long way
7 towards getting the consolidation and consistency and
8 removing the redundancy that everybody is talking
9 about.
10 The specific way in which you do is that
11 you ingest the top-level guide, the documents on the
12 left, into SysML and each individual paragraph becomes
13 a requirement, and then, you take the next set of Reg
14 Guides, and then, have the traceability to those top-
15 level guides. And it's persistent and it's permanent,
16 and you can create dependency matrices and tables to
17 see those relationships, and then, you can start
18 aggregating. And also, when updates occur, you can
19 easily see the impact on related requirements and
20 related documents.
21 So, I would just make the recommendation
22 that, when you do that, look at the SysML or the MBSE
23 contract, which you seem to have, that this would be
24 the top priority, not REEVES.
25 CHAIR ROBERTS: Good. Thank you, Myron.

1 MR. DARBALI: Yes, thank you. We
2 appreciate the insight and the feedback on that.
3 And one thing I'd like to add as far as,
4 yes, we have a lot of Reg Guides, but, historically,
5 the Reg Guide development is driven by the standards
6 development. And so, it's not just our Reg Guides
7 that are somewhat overlapping, or a lot of them.
8 That's the case with other industry standard
9 organizations, that they are facing the same issues
10 with standards that are no longer being updated or
11 that are being consolidated or replaced.
12 So, the Reg Guide process, typically,
13 tries to catch up with that. So, that's one
14 challenge. But that's certainly something that we
15 want to consider; see what efficiencies we can get out
16 of that. Ideally, you know, 20 years from now, we're
17 not looking at -- we're looking at a simpler picture
18 for these.
19 Okay. And then, the next slide is just
20 another example. This would be criteria for a safety
21 system, programmable digital devices. And for this
22 one, the main guide is Reg Guide 1.152, recently
23 revised. And it incorporates that pointer to Reg
24 Guide 5.71, and then, it endorses the 2016 version of
25 7-4.3.2.

1 That was one of the Modernization Plan
2 recommendations, things to do in the future. The
3 overall improvement was endorsed in the 2016 version
4 of 7-4.3.2, and that figure identifies the applicable
5 clauses for that technical area -- again, an example
6 of those figures that we developed.
7 So now, we'll start covering the recently-
8 completed and the ongoing activities in the area of
9 regulatory infrastructure and modernization. So,
10 we're going to start with policy and rulemaking
11 activities.
12 So, in May of last year, the Commission
13 issued SRM-SECY-22-0076, where it approved the staff's
14 recommendation to expand the existing policy for the
15 underlying common-cause failures and allow the use of
16 risk-informed approaches to demonstrate the
17 appropriate level of defense-in-depth. The Commission
18 provided edits to the core points in the policy and
19 directed the staff to clarify in implementing guidance
20 the new policies, independent of the licensing
21 pathway. The Commission also directed the staff to
22 develop the implementing guidance within one year of
23 issuing the SRM and that was BTP 7-19, which we'll
24 talk about later.
25 And we've talked with the Committee a lot

on this SRM, so I think we can move forward to slide 15. Okay.

So now, we're going to talk about the incorporation by reference of IEEE 603-2018. As was mentioned, 10 CFR 50.55a(h) provides requirements for the design of protection and safety systems for nuclear power reactors and endorses the 1991 version of IEEE 603. It's important to incorporate by reference the 2018 version because the 1991 version is over 30 years old and has undergone multiple revisions.

In addition, many applicants and vendors are using versions that are more recent than the 1991 version, and industry stakeholders have expressed that incorporating by reference the 2018 would be an incremental step toward meeting the needs of both operating reactor licensees and advanced reactor applicants.

The effort to incorporate by reference the 2018 version has two objectives. First, to provide industry with the regulatory confidence to use the 2018 version in the development of safety-related I&C systems, and second, to streamline the NRC's ability to endorse new and improved standards that are developed to address digital technology advancements.

1 I have another slide on 603, but I can
2 take any questions.
3 MR. BROWN: Yes, I have one question. You
4 haven't presented that yet. I mean, that's one of
5 your planned changes.
6 MR. DARBALI: Correct.
7 MR. BROWN: You made an effort to change,
8 to provide some updates in the rule for 603-1991 I
9 guess a number of years ago --
10 MR. DARBALI: Yes.
11 MR. BROWN: -- and the Commission said,
12 no, they didn't want to go forward with that.
13 MR. DARBALI: Correct.
14 MR. BROWN: And what we attempted with our
15 comments from the Committee at the time was to clarify
16 some of the things -- not to eliminate anything, but
17 to clarify what they meant in more common terminology
18 that we were using at the time -- the deterministic
19 predictable and repeatable type words. Control of
20 access only addressed physical access as opposed to
21 what have you.
22 MR. DARBALI: Uh-hum.
23 MR. BROWN: So, we tried to get some
24 changes and that was all they said no.
25 My concern -- we haven't looked at it yet;

1 I'm just hoping the Committee looks at it -- that we
2 don't want to lose what's in the 1991 version. If
3 somebody comes along and deletes the requirement or
4 the idea of independence and says, "Well, gee, risk-
5 informed says you cannot be independent, that's kind
6 of dumb," we don't want to lose the stuff that's
7 there, and the way that's implemented today, it's in
8 the rule. So, applicants have to -- that's law.
9 MR. DARBALI: Right.
10 MR. BROWN: Well, law, as issued by the
11 Commission.
12 So, my concern here, if we don't want to
13 lose -- hopefully, we're not going to allow it to be
14 lost, what we have there today in terms of the
15 fundamentals, which are inclusive in there. But it
16 would include control of access, to put it into the
17 form of not just physical, but communication access,
18 et cetera, et cetera.
19 Okay. I'm just throwing that out on the
20 table to make sure we don't lose the benefits, because
21 we've gone a lot of springboarding from the 1991
22 version in the applicants' stuff that's come in today
23 to make sure they meet this, the boundary conditions
24 of the fundamentals.
25 MR. DARBALI: Correct.

1 CHAIR ROBERTS: The question I had that I
2 was hoping to get an answer to here is, from a big-
3 picture perspective, what are the gaps? You know,
4 what do you not have using the 1991 standard that's
5 important that the 2018 standard picks up?
6 And I guess the second aspect is Charlie's
7 question: what is in the 2018 standard that would be
8 controversial or maybe not as protective as the 1991
9 standard?
10 MR. PAIGE: So, I can start off, and then,
11 turn it over to you, Samir, give more specifics.
12 So, Jason.
13 So, to your point, Member Brown --
14 MR. BROWN: I'm not a member.
15 MR. PAIGE: Oh, okay. Okay.
16 (Laughter.)
17 MR. BROWN: Bear in mind that I'm just a
18 consultant.
19 MR. PAIGE: Mr. Brown, Consultant Brown.
20 MR. BROWN: The people who are hired, our
21 comments are only comments.
22 MR. PAIGE: Oh, yeah.
23 MR. BROWN: You are in charge.
24 MR. PAIGE: So, we have just started this
25 activity and we have a working group, and we're

1 looking into those specific questions that you're
2 presenting to us today.
3 Just giving an overview, so one of the
4 activities that we're doing, as a working group, is
5 we're doing a comparison between the 1991 version and
6 the 2018 version to see if there's any differences.
7 From an initial comparison of the two documents, it
8 seems like the 2018 version just provides
9 clarifications to the 1991 version. There's no
10 removal of provisions or requirements from the 1991
11 version. So, that's our initial assessment of the two
12 documents.
13 And then, to your point or to your
14 question of "Are there any gaps between the two
15 documents" -- so, I wouldn't say it's a gap. I would
16 say it's more of an enhancement. So, the 1991 version
17 -- correct me if I'm wrong, Samir -- but the 1991
18 version does not include a provision on CCF. So, that
19 was only introduced in 1998. So, I would say that the
20 2018 version is an enhancement because it has a
21 requirement for CCF.
22 And I'll just close by saying that we will
23 have a public meeting on this activity later this
24 year, so that we'll be providing more of our results
25 from our assessment and provide more specifics on this

activity.

CHAIR ROBERTS: Yes, thanks. That leads to one specific question I had -- it's actually on your next slide -- talking about that Section 5.16 on common-cause failure.

The words that were in the 2018 standard seemed to me to be very similar to the words in IEEE 379, which is endorsed by Reg Guide 1.53. So, it doesn't sound like that really adds anything from the standpoint of a requirement or an allowance, whatever you want to call it, that currently doesn't exist.

But it leads to a question, a more general question that I can probably ask now, and then, maybe we'll take a break after this question. It is the BTP 7-19 talks about common-cause failure being a beyond-design-basis attribute. I forget the exact word group in the BTP.

And so, when you've got a design-basis document like IEEE 603 or IEEE 379, it's not clear what applies to the beyond-design-basis-type assessments that the BTP and the 2022 and 1993 Policy Statements direct the applicant to do, and that you all do when it's reviewed. So, it's unclear to me whether that discussion in 5.16 or IEEE 379 applies in BTP 7-19 and during a common-cause failure assessment

1 for digital I&C.

2 Now, before Rev 8 of the BTP, the BTP is

3 very specific to software. And so, you could draw a

4 line between the IEEE standard and this discussion

5 here and the very specific requirement to go look at

6 software common-cause failure. But Rev 8 of BTP 7-19

7 added hardware to the mix. And so now, I'm kind of

8 confused how that all fits together.

9 You've got a requirement to kind of posit

10 a common-cause failure for BTP 7-19, but the Reg Guide

11 -- I'm sorry -- the IEEE standards would allow you to

12 rule out the common-cause failure, based on a number

13 of different criteria. You know, good design

14 practices, good maintenance practices, good operating

15 practices, all those things are means to rule out a

16 common-cause failure on a design basis.

17 So, it's not clear to me what that means

18 for a beyond-design-basis. I was wondering if you

19 could comment on that. What is the intent? Is there

20 a gap? Or, you know, what am I missing?

21 MR. TANEJA: So, just as my personal

22 perspective -- this is Dinesh -- we want the designers

23 to assess this hazard in their design process. There

24 is a potential -- firmware, hardware, or software --

25 there's a potential of common-cause failure in any

1 designed equipment. I mean, you know, if you have
2 multiple of them, there's always some driver that
3 might affect not only one division, but, you know,
4 multiple of them.
5 So, that assessment is a good design
6 practice. And I think what the 2018 version does, it,
7 basically, forces them to acknowledge that they've
8 done the due diligence in assessing a potential CCF's
9 impact and what design features are implemented to
10 address those types of things.
11 Whereas, the Commission Policy says that,
12 you know, if you do a good design and do the good due
13 diligence when you do the design, a potential of
14 common-cause failure, therefore, would be beyond-
15 design-basis.
16 So, I think there are two ways of looking
17 at it, as you've done a good design; you've done good
18 due diligence, but, beside that, you know, there is
19 "unknown unknowns" that put you into that position.
20 Then, what are you backup plans?
21 And I think that's where the Commission
22 Policy takes us. If you do what the requirements are,
23 and if you are not cognizant of some "known unknowns"
24 -- and I think, whenever I think of that, it is Y2K
25 comes to my mind. I think we really didn't anticipate

1 what happens when I go from '99 to 2000 and I'm using
2 only two-digit numbers, right?
3 So, it's those kind of situations where
4 you really -- it's an obvious oversight when you look
5 at it in hindsight, but, you know, sometimes we
6 designers don't think of all the scenarios. And so,
7 if those scenarios bite you, you have some alternate
8 plan. And I think that's where the BTP takes us or
9 the Policy takes us. That's my perspective.
10 CHAIR ROBERTS: So, I would say that this
11 Clause 5.16 would not apply to screening out CCFs when
12 you're doing BTP 7-19; that you've got to posit that
13 you have the common-cause failure in whatever part of
14 the hardware. And so now, your four-channel system is
15 a one-channel system.
16 MR. TANEJA: Well --
17 MR. BROWN: I want to amplify his comment.
18 MR. TANEJA: Yes?
19 MR. BROWN: If you establish an
20 architecture that's truly independent, it's a risk-
21 informed decision that the hardware pieces themselves
22 from channel to channel to channel, they're not going
23 to propagate. The only way, the only reasonable way
24 is the software approach of communication of software
25 data. You know, when you feed, I'll say, a loading

1 unit, and one stream of data can lock up one and
2 you've got a good chance of locking up the others.
3 And that's why you put watchdog timers in, for
4 instance.
5 Is that perfect? Nothing's perfect. But
6 from a hardware standpoint, you can really get wrapped
7 around the action. Are they supposed to build
8 channels out of different hardware? That's nuts.
9 Okay? You just cannot.
10 That's where the principles protect you,
11 and it's a risk-informed decision that says, look, I'm
12 going to use the same operational amplifier in each of
13 the divisions and they're going to work. If one
14 fails, it fails. If a resistor fails, it fails. I
15 don't have to have different vendors' resistors.
16 I mean, it's just common sense has to
17 reign somewhere in your -- I mean, we never argued
18 about hardware, in any of our design developments over
19 LARs in the last 16 years, we have not argued or made
20 any points about hardware common-cause failures from
21 channel to channel to channel, because it's just too
22 hard.
23 Now, can something happen? Gosh, of
24 course, anything can happen if you really want to work
25 on it.

1 CHAIR ROBERTS: Yes, and, in my opinion,
2 this is an area that requires some further thought.
3 MR. BROWN: Yes, exactly. And I just find
4 your comment --
5 CHAIR ROBERTS: But I'll take what Charlie
6 said and maybe turn it around a little bit. If you go
7 back way before digital I&C and back into the 1960s,
8 this Committee was very concerned about ATWS. And
9 ATWS had nothing to do with software. ATWS had to do
10 with common-cause failure and how could you have a
11 common-cause failure of the system you're counting on
12 as either one barrier or a major barrier, your
13 defense-in-depth? And so, eventually, a requirement
14 was added for a very specific set of circumstances to
15 cover those types of scenarios with a diverse system.
16 And I think it's important to keep in mind
17 that the ATWS question is somewhat separable from the
18 underlying digital I&C question. And the digital I&C
19 question, as Charlie said, I think, in my opinion,
20 adding hardware in BTP Rev 8 opened up a potential
21 Pandora's box. And it's probably important to try to
22 define that box and what is it that people are
23 expected to do.
24 I will agree with Charlie that it's kind
25 of crazy to expect a different technology resistor in

1 each of the four channels because the idea of a
2 common-cause failure in resistors. You know, that
3 technology is well enough understood that that's not
4 a concern at that level.
5 But, on the other hand -- and we'll
6 probably get to this later -- the integration of
7 different parts of the safety systems into one box or
8 one set of boxes does, to me, add a new potential
9 hazard; that now, even though you think there is
10 independence and you met all the diversity and BTP 7-
11 19 requirements, and there is all this stuff, there's
12 still these hardware common-cause failures. You know,
13 the power supplies all decide to fail for some reason
14 and all four channels go to lunch at the same time
15 because of that.
16 But we seem that we're back to the
17 original ATWS concerns from 50 years ago, where now
18 it's not because of the digital I&C necessarily, the
19 technology; it's because of the integration that that
20 technology allowed doing. And that's something that
21 probably needs to be considered in the context of
22 specific applications.
23 We've got Limerick coming up, you know,
24 that relatively soon you'll be presenting to us. It's
25 currently scheduled for October.

1 And that's what I'm sure we'll be asking
2 about; it is, okay, from a big-picture perspective,
3 integrating all these systems into one platform, even
4 though it's diverse and it's got all the backups from
5 the BTP, have we thought about the consequence of the
6 common-cause failures of the hardware or something
7 else? All the things that are exempted from the
8 design basis, you know, they're still possible.
9 We all know the history of things like the
10 -- what was it? -- the Air Force reactor that had the
11 design or configuration error where all the nuclear
12 channels were wired such that, as soon as it got to
13 the power range, they all went down to zero. You
14 know, nobody ever thought about that kind of common-
15 cause failure. It's not a software issue. But it
16 happened and they lost that reactor.
17 So, that kind of thing drove the thought
18 process, I'm sure, for ATWS back in the day. And so,
19 that gives you a big-picture thought process of the
20 degree of integration that caused a new set of hazards
21 that maybe go beyond what BTP 7-19 was intended to
22 cover. Maybe it's covered more here, but it's not
23 clear how.
24 It may be a bit of a confusing diatribe
25 here, but it's probably worth your stepping back and

1 thinking about: what was intended with the hardware
2 common-cause failure in two branches? Was the intent
3 to really cover it at a granular level? Or was the
4 intent to cover it at more the system level?
5 MR. BROWN: But to amplify that a little
6 bit, the integration is the thing that you didn't have
7 when you had all analog systems. You didn't have the
8 same level of integration. And you see it in some of
9 these designs that have been proposed.
10 The example I gave earlier where all the
11 data was going into one communication device and
12 through one controller before it ever got to the main
13 control room, that one box is a piece of hardware, as
14 well as software. If it fails, nothing went forward;
15 the main control room went blank.
16 There's circumstances where a generator,
17 you like to have the control, speed control be totally
18 independent from the overspeed trip circuits. But if
19 you integrate them in with the same common pair of
20 auctioneered power supplies, guess what? That can
21 create a problem. And, in fact, it actually did
22 create a problem in an actual plant that I had to deal
23 with back in my earlier -- 20 or 25 years ago, 30
24 years ago, that we had to use -- well, it wasn't that
25 long ago. It was only about 15 years ago, after I had

retired.

It turns out that one power supply of the two literally drove the controller to overspeed, and it told the overspeed controller -- it disabled it, so it didn't work. Fortunately, there was an operator standing there and hit the trip throttle valve right before it went over, 150 percent overspeed. So, they immediately went back and decided they would use separate pairs of auctioneered power supplies for each of the two.

So, integration kills you in these things. And everybody thinks in the world of communications everything is integrated. They've got single points of everything, and all of a sudden, one thing goes out and you've lost the bubble totally.

So, that's the key. We've got to make sure we don't put the applicants in a situation with this additional thing about hardware failures, common-cause failures, that we don't compromise. Independence is, again, kind of the savior in this. Okay? You have separate cabinets, separate power supplies for each one of them, for the various protection channels.

When you've got a single-pass controller and there's no overspeed, no this or that, you're

1 subject to whatever fails. That's the way it goes.
2 There's not much you can do, but turn a switch. The
3 contact should operate the punch-and-start. The
4 contactor fails; the pump doesn't start. So, what do
5 you do? Put in a separate -- if it's critical. If
6 it's not, then you go on.
7 We've just got to be careful that we don't
8 kill the stuff.
9 CHAIR ROBERTS: Yes.
10 And Dennis?
11 DR. BLEY: Thank you. I almost forgot
12 what I was going to say.
13 I agree with all the points both of you
14 have been making, although I would point out, when you
15 get to the hardware common-cause side of things,
16 people who do risk assessment know how to model that.
17 They don't know how to handle the software common-
18 cause very well.
19 So, those things can, in fact, be modeled.
20 And sometimes you look at the diversity of, say, trip
21 signals. You have more than one parameter that could
22 lead to the trip. When you get enough of those, maybe
23 you don't need to do an analysis because you can see
24 the redundancy both in equipment and in sources of
25 signal, although you really do need to search for

1 things that could tie them together.
2 The easy stuff is common power supplies,
3 that sort of thing. The harder things are common
4 maintenance. But at least those can be addressed.
5 CHAIR ROBERTS: Okay. Yes, Samir, did you
6 want to say anything? Or should we go ahead and take
7 our break?
8 MR. DARBALI: Just to add on the inclusion
9 of 5.16, currently, common-cause failure or the
10 criteria to address common-cause failure, that comes
11 from the Policy originally in SRM-SECY-93-087, now in
12 SRM-SECY-22-076 and the Staff Guidance and the BTP.
13 The inclusion of Clause 5.16 in IEEE 603,
14 now that's an industry standard. And by incorporating
15 that standard into the rule in 50.55a(h), now we
16 actually have a regulatory requirement for addressing
17 common-cause failures. And what 5.16, basically, says
18 is just that common-cause failure is something that
19 needs to be addressed by the applicant. So, that's
20 the benefit of, or another benefit of incorporating by
21 reference in 2018.
22 CHAIR ROBERTS: Sure, but do you agree, do
23 I have right that that's just for design-basis type of
24 evaluations; that for the Policy from the Commission
25 back in '93, it was more of a beyond-design-basis

1 evaluation, kind of consistent with ATWS?

2 MR. DARBALI: Right. I think Dinesh kind

3 of explained it, but, right, 603 is, ultimately,

4 industry guidance. We're incorporating that by

5 reference.

6 The requirement is to address it, but the

7 Policy does clarify inasmuch as it is beyond-design-

8 basis.

9 I don't know if I really am answering the

10 question. Or I don't know if we can.

11 MR. TANEJA: Well, it is. It is part of

12 the design-basis, right? I mean, you assess common-

13 cause failure.

14 I think the example that you're bringing

15 up, shared power sources -- right? -- I mean, those

16 kinds of things you should assess as a designer any

17 potential avenue that could drive common-cause

18 failure, right? You know, those type of scenarios.

19 I know we have all these other criterias

20 in 603 which kind of protect us against common-cause

21 failure; those clauses do. If we say independence,

22 that, essentially, is one of the element that protects

23 us from a potential common-cause failure of a random

24 type in hardware. I mean, we do that. We say, you

25 know, maintain separation between cable trays of

1 different divisions. So, it doesn't take out both of
2 my cables in one cause or one initiating event.
3 So, I think we have these clauses,
4 essentially, to protect us against possible common-
5 cause failures. We require equipment qualification.
6 We require them to identify and to quantify life on
7 each component, so they don't have -- they don't reach
8 the end of life at the same time they need to be
9 maintained, right? So, those are the things that
10 really are built into the other clauses that protect
11 us against common-cause failure.
12 But some of these integrated design
13 decisions that we have been talking about, I think
14 what this clause says is, hey, look at your design and
15 make sure you are not creating any of these potential
16 common-cause failure scenarios. Right?
17 Now, having done that, I think the Policy
18 says that, if you've done your due diligence and you
19 really assess your potential of CCFs in your design,
20 there are things that could still happen. And for
21 those, what do you do? And I think that's where the
22 beyond-design-basis comes in; that there are these
23 "unknown unknown factors." I mean, you've done your
24 due diligence, but something gets you down the road
25 because you did not envision it. And that's really

where the adequacy of defense-in-depth and all these other elements are there to really protect you against those potential scenarios. Right?

So, I think, you know, we can say that this is within design-basis and Policy is kind of beyond-design-basis, provided that this is done within design-basis.

DR. SCHULTZ: Samir, what are you bringing forward to the public meeting in the third quarter and what are your expectations for the outcomes? You already mentioned on the previous slide that industry has been utilizing other versions, other applications associated with this area. And what are you expecting as an outcome from the meeting?

MR. DARBALI: Well, from the particular meeting -- and I'm going to let Jason correct me -- but from the particular outcomes of the meeting, it is feedback on the staff's approach. The staff will lay out the plan for the rulemaking and we'll address the issue with 5.16 as well. And so, we want to hear feedback from industry on that task.

As far as the application ones, you know, 603-2018 is in 50.55a(h). We expect more regular certainty and industry would see a recent version that matches more with their practices in design

development and implementation of digital systems.

Right now, even since the 1998 version of the standards, we've got through multiple reviews, Topical Reports, and licensing applications where the licensee says, "Well, my design needs the 1998 version," or the 2009 version, or the 2018 version. And we, the staff, have to say, "Okay. Well, that's right, we have to see how that matches with the 1991 version."

So, it clarity and certainty to the applicants and, also, facilitates the staff's reviews, and also, lays down the foundation for when the 2028 version gets issued. And we understand we have some lessons learned, that we can also forward with endorsing that. But it doesn't remove from the key criteria.

But, Jason, anything to add?

MR. PAIGE: Yes. This is Jason.

So, that was a good summary of what we plan on presenting during the public meeting.

I just have to add that the working group, they're doing a lot of work to complete this activity. And like I said, they're doing analysis to look at the differences between 1991 and 2018. So, we'll present the results of that analysis during the public

1 meeting.

2 They're looking at the issues identified

3 under the 2009 rulemaking. So, we're evaluating those

4 issues and making a determination on how those issues

5 were resolved. So, we'll present that during the

6 public meeting.

7 So, really, the purpose of that public

8 meeting is kind of to give our basis or kind of give

9 our proposal for what the rulemaking will look like,

10 and then, to get industry or external stakeholder

11 feedback on that proposal to help inform our pathway

12 for that rulemaking.

13 MR. BROWN: So, the intent here is to go

14 back, then, and modify 10 CFR 50.55a(h)? Because it

15 says 1991. You have to put this in place if you want

16 to implement that in the future. So, it would be

17 similar to what we attempted to do eight or nine years

18 ago. Only, instead of finishing the position based on

19 comments, it would be the new IEEE standard.

20 MR. PAIGE: That's correct.

21 MR. BROWN: And it's to look at that very

22 carefully, in other words?

23 MR. PAIGE: Right. That would be

24 incorporation by reference of that 2018 version of --

25 MR. BROWN: Yes, but the point being you

1 have to change the rule.

2 MR. PAIGE: Correct.

3 MR. BROWN: You have to have a rule --

4 MR. PAIGE: There would have to be a

5 rulemaking for it.

6 MR. BROWN: So, where it says IEEE

7 standard, including it under protection system, dated

8 such-and-such, that would become 2018 for the future

9 after that? Is that correct?

10 MR. PAIGE: Correct.

11 MR. TANEJA: One of the other things that

12 we are looking at --

13 MR. BROWN: Is that correct?

14 MR. PAIGE: Correct.

15 MR. BROWN: All right. Thank you.

16 MR. TANEJA: So, one of the other things

17 we are looking at as a part of the 603 working group

18 is we are trying to see if we can model this to the

19 ASME in an incorporation by reference. So, right now,

20 I think we have 279 IEEE and 603-1991, as part of the

21 rule, right? So, we are thinking of keeping as is and

22 adding 2018 to it. Right?

23 MR. BROWN: I'm looking at the first

24 paragraph. I didn't read all the way down through.

25 Just 603 is always 1991. And I've got the rule open

1 right now. And 279 just says, "279." Now, maybe it's
2 farther down and I missed that, but I do not see where
3 there's a date in paragraph 1, 2, or 3 under a(h).
4 MR. DARBALI: Yes, we can find it. But I
5 think it's based on the construction permit. It says,
6 by this date, use this version of 279, but after this
7 date, use this version of --
8 MR. ROGGENBRODT: I have the reference in
9 (h)(2) which states IEEE Standard 279-1968, referenced
10 in paragraph (h)(2), and then, the 1971 version, also,
11 of the IEEE 279 standard.
12 MR. BROWN: It says 1968 --
13 MR. ROGGENBRODT: My apologies. IEEE
14 Standard 279-1968 is referenced --
15 MR. BROWN: I'm looking at a(h) right now.
16 I thought it said --
17 MR. ROGGENBRODT: (h)(2).
18 MR. BROWN: I'm looking at (h)(2).
19 Anyway, we don't need to resolve that right now.
20 MR. ROGGENBRODT: Right, right.
21 MR. BROWN: Just so we know what we're
22 talking about.
23 (Laughter.)
24 DR. SCHULTZ: Jason, this is Steve Schultz
25 again. It sounds like your expectation is that you

are going to go to the meeting with the working group's proposals for ideas, and you're expecting reasonable alignment to come out as an outcome of the meeting?

MR. PAIGE: So, when we had that -- so, when you say, "alignment," are you talking about alignment with industry or internal alignment? Because when we --

DR. SCHULTZ: I talking about both. I'm just asking --

MR. PAIGE: So, I just wanted to clarify. So, yes, when we have that public meeting, we will definitely be aligned internally, because it will be the NRC's proposal or the NRC staff's proposal for that rulemaking.

And to back up a little bit, we had a public meeting last year on this activity. And the purpose of that public meeting was to present different options to proceed to meet those objectives that were on the previous slide, slide 15, providing a pathway for industry to use the 2018 version of the standard. And we received feedback on what option to implement. And that feedback was to implement this rulemaking option.

So now that we got that feedback from

1 industry, we're exploring that idea. We're exploring
2 on what we need to do to complete that rulemaking.
3 And so, we plan on presenting that during this public
4 meeting in the third quarter of this year. And we're
5 hoping to get additional feedback on that proposal for
6 what the rulemaking will look like.
7 DR. SCHULTZ: Those are planned and
8 scheduled?
9 MR. PAIGE: Yes.
10 DR. SCHULTZ: Thank you.
11 MR. PAIGE: You said, "planned and
12 scheduled"? I didn't hear that question.
13 DR. SCHULTZ: Planned and scheduled?
14 MR. PAIGE: Yes, right.
15 DR. SCHULTZ: Thank you.
16 MR. PAIGE: Yes.
17 CHAIR ROBERTS: Okay. Let's take a break
18 until 10:40 Eastern Time.
19 (Whereupon, the above-entitled matter went
20 off the record at 10:28 a.m. and resumed at 10:41
21 a.m.)
22 CHAIR ROBERTS: Okay, we're back. Our
23 meeting is back in session.
24 Samir, I guess back to you.
25 MR. DARBALI: Thank you.

We're now on slide 17.

So, this slide shows the Reg Guides that have been issued or revised since the last time we briefed the Committee on the overall I&C activities. It was in September of 2021.

So, first, we have Reg Guide 1.152, Revision 4. We talked about that a little bit. That was issued in July of 2023. It endorses, with some exceptions and clarifications, the 2016 version of IEEE 7-4.3.2. The staff briefed the Committee on the draft guide in 2022 and our final guide in 2023, and addressed the Committee's recommendations, including incorporation of that pointer to Reg Guide 5.71.

Second, we have Reg Guide 1.250, which we've talked about a bit. That was issued in October of 2022, and it endorses with clarifications NEI 17-06 on the use of IEC 61508, "Certification to Support the Acceptance of Commercial Grade Digital Equipment." This staff briefed the Committee on the final Reg Guide in 2022.

And last, the staff revised Reg Guide 5.71 --

CHAIR ROBERTS: Yes, Samir, we did talk about this some in the session.

MR. DARBALI: Yes.

1 CHAIR ROBERTS: What you did was endorse
2 an NEI standard. And so, Dinesh, going back to what
3 you said earlier, that says that the NEI themselves,
4 they're not using that standard? It seems like it's
5 not just you that worked hard on a process that nobody
6 is using, but the NEI initiated it. So, it's kind of
7 puzzling.
8 MR. TANEJA: Well, this is one of those
9 activities that got identified back in 2016. And we
10 created a joint working group between the industry
11 stakeholders and the NRC staff. And there was a lot
12 of interaction that went on before we got to the Reg
13 Guide stage.
14 And we did some observations of different
15 audits that took place of the certifying third-party
16 body. So, a lot of those activities were taken into
17 consideration to see the feasibility of this third-
18 party certification that we can really leverage, you
19 know.
20 So, all that was done to truly help the
21 licensees streamline the dedication activity. I think
22 one of the issues with the dedication requirement
23 right now that we do is it's done in accordance with
24 the EPRI TR-106439 on how to do commercial grade
25 dedication of digital equipment.

1 And so, one of the critical
2 characteristics there is in dependability critical
3 characteristic. And the way to verify that
4 dependability is, essentially, solve that part of it,
5 right? And it's to do vendor surveys.
6 So, the problem with that is that, if you
7 are not buying a whole lot of the stuff, these
8 commercial vendors are not going to allow you to come
9 and take a look at their documents and their QA
10 process and their software requirements, and all that
11 kind of stuff.
12 So, the idea was, if you go with some
13 certified components, the manufacturer is required to
14 provide all the information to the third-party
15 certifying body, which, essentially, are what you
16 would do as part of the commercial grade survey.
17 So, really, in lieu of performing a
18 commercial grade survey, we said that, you know, if
19 there is a valid certification, you could leverage
20 that instead of conducting a commercial survey. So,
21 it really streamlines the process.
22 It really is an efficiency factor. It
23 really opens the doors to a lot of different hardware
24 that's out there that is certified. So, maybe it's a
25 matter of time.

1 And I think one of the feedbacks that we
2 got is another Reg Guide. One of the clarifications
3 is that, if you are going to use this process, you
4 need to amend your QA program, and that QA program has
5 to come in as a LAR, the first user, and thereafter,
6 I think it sets the precedent.
7 And I don't know if that is the holdup or
8 what is happening, you know, but, basically, it is
9 their program is to perform a commercial grade survey.
10 And instead of that, they are going to use this. So,
11 there is modification to their program that really is
12 as simple as that.
13 And we said that we will do a Safety
14 Evaluation, and then, a future user can just reference
15 our Safety Evaluation.
16 MR. DARBALI: So, that's the discussion
17 that we've been having on implementation. Yes, that's
18 really what it is.
19 MR. PAIGE: And can I just add -- this is
20 Jason.
21 So, to emphasize what Samir said earlier,
22 we don't want to give the impression that NEI did all
23 this work; we did all this work, and now, it's just
24 sitting on the shelf and nothing is being done or
25 nothing is -- that the document is not being used at

this point.

You know, there are, like Samir said, there are internal processes that they are following, NEI is following, coordination and efforts between NEI and applicants. I mean, I think they're going through that at this point and having those internal discussions and going through their internal process to figure out how to use this Regulatory Guide.

So, I just don't want to give the impression that, you know, nothing is being done now that we've issued the Regulatory Guide. So, I just wanted to provide that.

CHAIR ROBERTS: Yes, okay. Thank you.

Dennis, you have your hand up?

DR. BLEY: Yes, I do.

Because I was thinking back to when the staff -- again, NEI brought this to the Committee, and we were a little skeptical of the need for it at that time. There was a very strong feeling that, if this wasn't in place, the plants were not going to be able to get the equipment they needed to keep the plants running.

So, I'm a little surprised it's taking a long time here to get this rolling. Maybe things have loosened up a little bit on the supply side. I don't

1 know.

2 CHAIR ROBERTS: Okay. Thank you, Dennis.

3 MR. DARBALI: Okay. Thank you.

4 And then, last, we have Reg Guide 5.71,

5 which the staff revised in February of 2023. This

6 revision clarifies the guidance on defense-in-depth

7 for cybersecurity; clarifies the issues identified

8 from NRC's cybersecurity inspections, and updates

9 guidance based on the latest NIST and IAEA

10 cybersecurity guidance. The staff briefed the

11 Committee on the draft guide in late 2021 and

12 addressed the Committee's recommendations.

13 So, these are the completed Reg Guides.

14 Next slide, on slide 18.

15 The software development Reg Guides which

16 we've talked quite a bit about, but what we've done

17 with these Reg Guides is we had a research assistant

18 request that led to two Technical Letter Reports that

19 were completed in 2022 on the options to revise Reg

20 Guide 1.168 and on the overall organizations of Reg

21 Guides 1.168 through 1.172.

22 So, based on the recommendations in the

23 Technical Letter Reports, the approach to update these

24 Reg Guides will be a two-step process. First, Reg

25 Guide 1.168 will be revised to endorse the 2016

1 version of IEEE 1012, and then, the staff will explore
2 the overall organization of all of these software
3 development Reg Guides to determine, as has been
4 mentioned, to determine the improvements, the level of
5 effort, and the main things involved with that
6 organization effort.
7 CHAIR ROBERTS: This is Tom.
8 I'm sure Reg Guide 1.168, we'll probably
9 get briefed on it when you're finished with it. But
10 I read through those research letters and one part of
11 it kind of caught my eye, which I want to ask you
12 about, which is the IEEE 1012, Appendix B, 4x4 table,
13 how to determine software integrity levels, wherever
14 that term is there, Level 4 versus Level 1.
15 The current Reg Guide says just use Level
16 4. The intent of the research level was to probe
17 whether you could actually use the table. And I've
18 had a little bit of experience using that table, and
19 there's two axes to that table. One of them is
20 consequence of failure, which is pretty
21 straightforward. The other one -- I want to get the
22 word group right here -- is "the likelihood of
23 occurrence of an operating state that contributes to
24 the error."
25 And the research letter talks about the

1 way you grade that being somewhat ambiguous and
2 suggests being a little more specific with how you
3 determine that. But it didn't really talk about what
4 that term even means.
5 And I found that some people interpret
6 that term as the likelihood of a software error, which
7 doesn't make a whole lot of sense to me because you
8 can't quantify the likelihood of a software error.
9 And, in fact, the output of the table is the degree of
10 V&V you do, which is kind of telling you what the
11 likelihood of a software error is.
12 And so, the question is, how do you
13 interpret the likelihood of occurrence in operating
14 state that contributes to the error. And we tried to
15 implement that in our program, you know, or 25 years
16 ago. We changed that to degree of system mitigation.
17 And so, it was very clear that it had
18 nothing to do with the software. It was a system
19 problem that says the consequence goes down on the
20 vertical axis and the likelihood of getting to the
21 consequence, given software, became the X axis. And
22 so, that became at least usable in our program I just
23 wanted to point that out.
24 And it may be worthwhile, if you're going
25 to go that way, to clarify what that X axis actually

1 means. Because the word group is not defined in the
2 IEEE standard and it can be misinterpreted. So, I
3 just leave that as a thought.
4 MR. ROGGENBRODT: This is Bill
5 Roggenbrodt. I'm assigned to that task.
6 And to your point, that's where the
7 updates are on our end and taking inputs from industry
8 as well. To your point of being at Integrity Level 4,
9 that is for the approach to be more of a graded
10 approach, depending upon overall system parameters.
11 You've got reactors of different sizes,
12 different designs. What would be, to your point, the
13 worst consequence of failure, and that's, I think,
14 what drove the Integrity Level 4 guidance.
15 Additionally, beyond just what type of reactor is
16 doing it, the factor of physics involved.
17 Also, to your point about how do you
18 manage that in Appendix B, Appendix B is informative,
19 not normative. So, we'll take that point certainly
20 under consideration to get that second point reviewed
21 and perhaps provide clearer language certainly.
22 Because that's the goal here, is to bring it in line
23 with more recent guidance, industry standards, as well
24 as overall clarity, so there's a lack of confusion.
25 CHAIR ROBERTS: That sounds good. Thanks.

1 MEMBER MARTIN: I'm going to ask some
2 questions. Member Martin.
3 Where do, say, the Reg Guide 1.250 and
4 these software development Reg Guides intersect? You
5 know, we live in a world today where, of course, you
6 have third-party organizations, companies that are
7 providing software, and maybe make claims of safety at
8 a very specific application, users of the software.
9 All right. Well, it's like 95, 99 percent
10 of what I need, but I'm going to develop some software
11 and interface with the commercial product. Will they
12 go in, and then, maybe dedicate under 1.250 what they
13 receive, if they have to dedicate, or maybe it's just
14 perceived as safety under a different context. And
15 then, have their software development work under this.
16 I just wonder if there's not a gap, a
17 potential gap, when you couple software development
18 with existing products that are offered that maybe are
19 leaving it to the developer to make the decision of
20 what is enough V&V. To me, if you do that scenario
21 where you have new software, in-house-developed
22 software interfacing with something from the outside,
23 it's all new. You know, you have to have it -- you
24 know, maybe the verification of the old stuff is
25 sufficient, but validation is where you really have to

1 pay attention.

2 Is there language, plant language, to

3 address that particular scenario where you use the

4 word clouge (phonetic) but you know what I mean,

5 right? It's not as clean as just, say, you know, a

6 very specific product for a very specific application

7 is going through a very specific QA process. It is

8 pieces that have come in from different places, but it

9 really should be treated as weak if it's so different,

10 even though the pieces might have some pedigree in a

11 different context.

12 MR. ROGGENBRODT: This is Bill Roggenbrodt

13 again.

14 To your point, and using terminology of

15 software development, because that's common in use

16 throughout the industry for so many years, the diagram

17 from earlier that's also available on the public

18 website, that's for, like, digital development

19 reliability, right, because you may not be using

20 software as the pure term versus --

21 MEMBER MARTIN: Right.

22 MR. ROGGENBRODT: -- programmable digital

23 languages.

24 With that, again, during the development

25 process -- and this is just off the top of my head --

1 that if you're going to choose to use a commercial
2 grade dedication product and you're going to have that
3 within the confounds of your not only design process,
4 but the V&V process that it encompasses, you're going
5 to have to make sure that that's where you would point
6 yourself as far as how you would apply it.
7 MEMBER MARTIN: Right.
8 MR. ROGGENBRODT: Sort of "it depends."
9 Are you going to use something that you developed in-
10 house or are you going to look to another supplier,
11 and what is their industry in the nuclear industry?
12 MEMBER MARTIN: Right.
13 MR. ROGGENBRODT: So, sort of that
14 dependency is critical.
15 Also, one thing -- and just off the top of
16 my head -- looking at diagrams really, as many people
17 do, I think -- there was a great job done by Senior
18 Roberto last year. It was that the safety feature --
19 and to your point, Charlie -- there's got to be this
20 fundamental design principle. You've got to make sure
21 it's put together in this framework diagrammatically
22 because it's that important.
23 But if it was true to size, I think the
24 center point or the safety of whatever you're looking
25 at would be a lot larger. Because that is where you

1 would have your fundamental design principles, whether
2 using digital technology or not. And then, you would
3 go into these other areas appropriately, to your point
4 with the commercial grade dedication digital devices
5 with Reg Guide 1.250.
6 So, in that manner, with that, plus the
7 other Reg Guides that are under revision, you would
8 kind of tell yourself, well, okay, safety is the big
9 picture, overall safety -- you know, system, plant,
10 public safety -- and then, what are the offshoots of
11 that? And then, the answer is, where it's maybe not
12 an answer, but just sort of an add-on of, "it
13 depends." You know, what kind of plant are you
14 building? What's your power level? What's the design
15 of the reactor? And it just goes on and on.
16 MEMBER MARTIN: Yes.
17 MR. ROGGENBRODT: But the safety is at the
18 core.
19 MEMBER MARTIN: Yes, and I wouldn't bring
20 the question up if I didn't have an analogy from my
21 background in design and analysis, where you have a
22 company, and, you know, there's a -- I don't know if
23 it's fair to say what company this is -- but they
24 offer a safety-related product. And it's not a tool
25 that has been used for safety analysis. And so, it

1 doesn't have the validation. It probably has pretty
2 good verification, I grant it that, but it hasn't been
3 validated against test problems, standard tests
4 problems, that complete the V&V story.
5 And I could very well see the same
6 scenario set up. But the language, I think Reg Guide
7 1.231 is where commercial grade dedication of design
8 analysis software lands. You don't find a statement,
9 black and white, you know, unless you're, like,
10 culturally sensitive to it, that you can have a
11 scenario where you have maybe a multi- -- well, maybe
12 a broadly applicable tool, software, that is adapted
13 into an environment that it has not been validated
14 for, and you need to do the extra work.
15 And my sensitivity is that the words
16 weren't there. I mean, it's a software development
17 activity. Even if one piece of it has been V&Ved in
18 a different context, it needs to be reexamined and
19 validated, confirmed. I didn't feel like the strength
20 of language was there --
21 MR. TANEJA: I think there is a little bit
22 of difference between the real-time system than
23 designer analysis software, right. So, I think we
24 addressed that in our Reg Guide 1.152, where we talk
25 about tools used during maybe testing of the real-time

systems. Right?

MEMBER MARTIN: Uh-hum.

MR. TANEJA: So, an example that we've had is, like, for example, you can take the Common Q platform, which is a commercial product, essentially, that has been dedicated. Right? But when you go into the application -- so, you do AP100. You're using Common Q, but your application is for that design.

But your V&V is, essentially, being done at the finished product. We do factory acceptance testing. We do all these things to a final product, which is a compilation of an application developed outside of the -- what I mean is there is the operating system, which really is part of the commercial grade dedication that comes with it. Then, you have the application software that you are building. You integrate the system. You design multiple boxes; how to tie them together. You write the program and a model work together. Right?

MEMBER MARTIN: Okay.

MR. TANEJA: So, it is really an integrated system V&V that needs to occur. And I think Bill was part of that; that we to Westinghouse and we did a lot of work on that.

So, I think that's an example --

1 MEMBER MARTIN: But you --
2 MR. TANEJA: Yes?
3 MEMBER MARTIN: -- probably have more
4 limit to your list --
5 MR. TANEJA: -- Yeah.
6 MEMBER MARTIN: -- of Reg Guides. I
7 appreciate what you're saying about 1.152.
8 MR. TANEJA: Right.
9 MEMBER MARTIN: Maybe that's where -- that
10 kind of covers it.
11 MR. TANEJA: It ties them together, right?
12 MEMBER MARTIN: It ties them together.
13 Okay.
14 MR. TANEJA: Yes.
15 MEMBER MARTIN: I appreciate that.
16 MEMBER BIER: Hi. This is Vicki. If I
17 can follow up on Bob's comment?
18 CHAIR ROBERTS: Go ahead, Vicki.
19 MEMBER BIER: One thing that I think is --
20 hi -- one thing that I think is important to bear in
21 mind is that the software industry has almost opposite
22 incentives to the nuclear industry. Everything in the
23 software industry is built around rapid to market and
24 getting customers signed up first, so that they don't
25 go to a different vendor, and then, okay, we can fix

all the problems in the software later.

And so, I think having regulatory control and V&V, et cetera, is really important. And, you know, Bob's comment about, what about safety products that were not designed for the nuclear industry, but could be useful for the nuclear industry, I think it's important to be cautious about those.

I mean, even SCADA systems are an example where the utilities probably want a higher level of verification and reliability, et cetera, than what the software industry will provide in a free market. So, there needs to be some regulatory control to ensure that that all happens.

Anyway, that's kind of a very high-level comment and it doesn't relate to specific applications, or whatever, but just something to bear in mind about the importance of this.

MEMBER MARTIN: Well, you know, in practice, you oftentimes have a different team doing the design versus the team doing safety. And so, it becomes cultural. Because people can be very myopic and say, "All right, this is my Reg Guide and I'm following design principles." And then, the safety person is coming back and going, "No, this is you need to be doing more integrated V&V," even with a product

1 you've gotten outside that's so-called safety.

2 But, like I said, I appreciate your answer

3 about really the testing, the 1.152 Reg Guide in this

4 particular case. And I'll go back and review that.

5 It might cover it.

6 I don't see an analogy in the world I come

7 from for something quite like that. But, of course,

8 that's where your management, your licensing

9 management, needs to be on top of things,

10 understanding the integration of everything. There is

11 responsibility, certainly, on the organization at

12 different levels to cover that sort of stuff.

13 But, anyway, I think it might be a little

14 big cleaner than other hearings.

15 CHAIR ROBERTS: Okay. Myron has his hand

16 up.

17 Myron?

18 MR. HECHT: Sorry, my comment was already

19 addressed by the fact that the systems must be

20 validated or verified with integrated hardware and

21 software in the final configuration. I think Dinesh

22 made that point.

23 This is in response to the earlier point

24 made by Bob Martin that, well, if you make

25 modifications or if you have a different environment,

1 how do you know whether you have an adequately safe
2 system?
3 So, sorry, I should have lowered my hand.
4 CHAIR ROBERTS: Okay. I see a hand up.
5 I don't know if that's still Myron's. I can't tell
6 whose hand that is.
7 MR. HECHT: I'm trying to lower mine.
8 CHAIR ROBERTS: Okay.
9 MR. HECHT: I don't always -- oh, there we
10 go. Okay.
11 CHAIR ROBERTS: Okay. Samir?
12 MR. DARBALI: Thank you.
13 So, we can move on to slide 19.
14 Okay. So now, we're going to talk about
15 the periodic updates to Reg Guides 1.53 and 1.62,
16 these two Reg Guides that were mentioned during our
17 briefings on the BTP. So, this slide is on 1.53; the
18 next slide is on 1.62
19 So, regarding Reg Guide 1.53 on the
20 application of the single-failure criterion, Revision
21 2 of the Reg Guide was issued in 2003 and endorses the
22 2000 version of IEEE 379. The latest revision of
23 IEEE 379 was issued in 2014, and the period review for
24 this Reg Guide was published in December of 2016.
25 The periodic review concluded that there

1 were no immediate technical or regulatory issues with
2 the current revision of the Reg Guide. The periodic
3 review did identify an issue for future consideration
4 for the need to reach alignment between the Reg Guide
5 and the other regulatory infrastructure modernization
6 efforts for addressing common-cause failures.
7 The periodic review concluded that there
8 is no impact to not updating the Reg Guide to address
9 this alignment issue, and the next periodic review is
10 due in 2026. And we do recognize that the Reg Guide
11 needs to be updated to reflect the latest CCF policy
12 and guidance, but, you know, the current revision is
13 usable. And we haven't heard feedback from industry,
14 again, on 1.53 and on 1.62, for the need to update
15 these Reg Guides. Like I said, we do recognize they
16 need to be updated, but we have competing priorities
17 in our workload, and as we are freeing up resources,
18 we can identify when these revisions can be made.
19 CHAIR ROBERTS: Yes, we discussed that
20 before the break, about the hardware CCF and the role
21 of that in the BTP and the beyond-design-basis, per-
22 design-basis aspects of it. I don't want to revisit
23 that discussion.
24 But one of the differences between the
25 379-2000 and 2014 versions really get to what Dinesh

1 was talking about, which is the 2014 version says,
2 yeah, you can use these programmatic attributes to
3 screen out CCFs, but you really ought to do a more
4 methodical FMEA or some sort of assessment to convince
5 yourself that that's really justified. And that's not
6 in the 2000 version. It's in the 2014 version. It
7 points to, I think it's 352. Is that the right
8 attributable standard? It's the FMEA standard. And
9 we see it has some guidance on how to do that
10 assessment of a CCF vulnerability.
11 And so, people might be doing it, and
12 maybe you expect people to do it, but I just throw
13 that out there as a consideration; that I think in the
14 IEEE guidance it says you really ought to be looking
15 harder at the potential for these CCFs, even if you're
16 screening them out.
17 MR. DARBALI: Right.
18 CHAIR ROBERTS: These are the criteria
19 that's in there. Now, I see some value to having that
20 in the guidance.
21 MR. DARBALI: Understood.
22 CHAIR ROBERTS: But as long as you're
23 getting those assessments, like Dinesh said earlier,
24 then people are looking at things like power supplies
25 and the common failure of power supplies, which in my

experience -- I've got maybe even a little bit more than Charlie does -- that power supplies are the weak link in systems often; that if you get power supply failures, then stuff happens that you haven't thought of.

MR. DARBALI: Uh-hum.

CHAIR ROBERTS: And digital systems like 5 volts, 4 volts, or whatever, however they're designed, voltages for the current generation, if you're outside of that range and don't lose power, strange things happen.

And so, it's just worth looking at that. That's just one example of a common-cause failure. Again, having the design-basis go to screen those programmatically on this makes sense, but it does seem like there's wisdom in that. The 2014 version of the IEEE standard, take a harder look at that.

MR. DARBALI: Okay. We can go to slide 20. Okay.

So, regarding Reg Guide 1.62 on manual initiation of protective actions, Revision 1 was issued in 2010. The periodic review for this Reg Guide was published in October 2017, and it concluded that there were no immediate technical or regulatory issues with the current revision of the Reg Guide.

The periodic review did identify an administrative issue for future consideration, again, for the need to reach alignment on the wording that is common between the Reg Guide and the BTP 7-19, which I believe was Revision 7 at the time.

The periodic review concluded that there is no impact to not updating the Reg Guide to address the administrative issue. And the next periodic review is due in 2027.

Again, we recognize the need to update these two Reg Guides to reflect the latest CCF policy and guidance. And again, it's a competing priority issue. Once we can free up resources, then we will identify when we can provide those updates.

MR. BROWN: The Committee did review that in 2010. There's a letter on it. So it was -- we had a comment I can't remember. I think you all did something with the comment. I can't remember what it was. So it was run through here.

MR. DARBALI: Thank you. Next slide. So, on slide 21, the staff issued Revision 9 of BTP 7-19 in May of this year. This revision implements the direction and the expanded policy in SRM-SECY-22-0076 and allows the staff to review risk-informed applications which may result in the use of design

1 techniques other than diversity.

2 The staff briefed the Committee on the

3 changes to this BTP and addressed the Committee's

4 recommendations specifically regarding Section

5 B.3.4.4. Staff is currently working on responding to

6 the ACRS letter, which included recommendations that

7 are more general and outside of the scope of the BTP.

8 Next slide. And regarding inspection

9 guidance, the staff issued a Digital I&C Operating

10 Experience Smart Sample Guide in February of this year

11 to provide support to baseline inspection activities

12 in the area of digital I&C notifications that are

13 mostly performed under 50.59.

14 The Digital I&C OpESS Smart Sample

15 provides examples where deficiencies may be present in

16 digital I&C equipment to help inform the inspection of

17 design modification and maintenance activities.

18 Past audit and inspection activities have

19 identified licensee issues with establishing and

20 maintaining the site control, maintenance, and testing

21 of digital equipment. And the document highlights two

22 examples.

23 One is where a modification was performed

24 without adequately evaluating and documenting

25 possibility of a digital CCF not previously evaluated.

1 And the other example is for incorrect wiring that
2 resulted in a main turbine trip from the initiation of
3 one single channel instead of the designed two-out-of-
4 three-channel logic.
5 CHAIR ROBERTS: I was wondering in general
6 what the experience has been. And the fleet has a lot
7 of digital I&C out there. Or is this it? Are these
8 three the only examples you point to that are
9 significant, or --
10 MR. DARBALI: These are the two major
11 examples identified in the document. I'm sure their
12 inspectors have captured other examples. And we
13 routinely evaluate licensee event reports for events.
14 We've addressed issues in the past
15 regarding embedded digital devices. So we had a
16 regulatory summary issued in 2016, and we also had an
17 information notice on that, also, in 2016. And again,
18 that falls into design control commercial-grade
19 dedication.
20 And so the next slide shows all of the
21 areas that this Op-E Smart Sample Guide supports. So
22 the idea is that as inspectors are using the
23 inspection procedures listed here for design control,
24 test and maintenance of equipment-reported risk, plant
25 modifications, cybersecurity, commercial-grade

1 dedication, age-related degradation, problem
2 identification and resolution, they're using those
3 inspection procedures. This Op-E Smart Sample Guide
4 aids and provides additional detail on how to do those
5 inspections. And that's really the benefit of it.
6 This is separate from IP-62 -- oh, I
7 forgot. It'll come back to me, but the inspection
8 procedure that we issued a couple of years ago for the
9 inspection of modifications done under license
10 amendment requests, so ISG-06. And it includes
11 inspection guidance for modifications done under the
12 alternate review process. 2751 (phonetic), I think.
13 CHAIR ROBERTS: Are these intended to be
14 proactive, reactive, or both inspections?
15 MR. DARBALI: Which one? This one?
16 CHAIR ROBERTS: The whole process. Is
17 this inspection guidance for evaluations after
18 something bad happens, or are these --
19 MR. DARBALI: No.
20 CHAIR ROBERTS: -- routine biannuals or
21 something?
22 MR. DARBALI: This particular Op-E Smart
23 Sample supports baseline inspection activities. So I
24 don't believe these are reactive inspections due to
25 something happening. Right. The other inspection

1 procedure I mentioned is for inspections for a digital
2 notification done through a licensing review.
3 So, to verify, it's oversight to verify
4 that the system is being installed and as described in
5 the license amendment request.
6 CHAIR ROBERTS: So I'm still trying to
7 understand, basically, would this inspection include
8 looking at digital I&C failures over the last
9 increment of time and looking at the licensee process
10 for looking for root cause and that kind of thing?
11 MR. DARBALI: I don't believe this Op-E
12 Smart Sample is intended to capture or trend issues in
13 the implementation of digital technology. That is
14 something that the staff does as part of our routine
15 work.
16 Again, there are some efforts to look at
17 licensee amend reports and to trend any particular
18 cause. But this particular Op-E Smart Sample does not
19 -- it really just provides the guidance for performing
20 those baseline inspections.
21 CHAIR ROBERTS: So, in terms of your trend
22 analysis, is that something that you publish? Is
23 there a place on the website to find this or -- you
24 know, just wondering what the stats look like.
25 MR. DARBALI: That's a good question, and

1 we can probably get back to that. I know in the past,
2 we used to do manual reviews of licensee event
3 reports, INPO reports, some international reports on
4 events. And then, with that, we identified if we
5 needed to do some sort of generic communication or
6 typically an information notice. And some information
7 notice resulted from that.
8 We do get notifications from our Operating
9 Experience Group, and we have not identified a trend
10 recently. But again, typically, when we start getting
11 those notifications, we start looking at -- we've seen
12 that before; is that something common? Is that
13 something we should develop a generic communications
14 on?
15 CHAIR ROBERTS: I'm just thinking out
16 loud. Maybe that's something we could reserve for
17 potential future interchanges to have you present to
18 staff in a certain period of time and say, this is
19 what we're finding. And I don't know if that would
20 need to be its own meeting, but certainly would like
21 to have some visibility into what the actual data is
22 telling you.
23 MR. DARBALI: Okay.
24 CHAIR ROBERTS: Okay. Thanks.
25 MR. DARBALI: Next slide.

1 Okay. And we've talked about NEI 20-07 a
2 bit, but this is, again, being developed by industry
3 for addressing common-cause failure in high safety-
4 significant safety-related digital I&C systems.
5 The staff has been engaging with NEI in
6 pre-submittal discussion since Draft Bravo of 20-07
7 was submitted in August 2020. After various draft
8 revisions and interactions between the staff and NEI,
9 NEI submitted Draft Echo in July of 2023. This latest
10 draft is significantly different from the previous
11 drafts, as it is the first attempt at defining a risk-
12 informed graded approach in alignment with the
13 expanded CCF policy in SRM-SECY-22-0076.
14 This draft proposes a risk-informed graded
15 approach and an iterative systems engineering process
16 for addressing digital I&C CCFs and proposes the use
17 of a safety case for presenting the results to the
18 regulator. I have a little bit more detail on the
19 next slide.
20 So, between March and April of this year,
21 there have been three public meetings where the staff
22 provided comments on Draft Echo of 20-07. As a result
23 of these public meetings, NEI plans to revise 20-07
24 and incorporate the staff's comments, hold a tabletop
25 exercise later this year, and submit Revision 0 for

1 NRC review and endorsement by the end of this year.
2 The staff is planning to review NEI 20-07.
3 It's a topical report, which can be referenced by
4 applicants in their licensing application.
5 CHAIR ROBERTS: Did you resolve the issue
6 of number of redactions in the document? In the
7 public version right now online, it's mostly black.
8 MR. DARBALI: I'll ask Michael Marshall to
9 answer that.
10 MR. MARSHALL: Yes. NEI did submit a
11 revision that has much less redactions, and we are
12 going to accept the public withholding request for
13 that. So I could check to see if you have the latest
14 version. I'll work with ACRS staff to make sure you
15 have the latest version of that document.
16 MR. BROWN: Is that Rev E.
17 MR. MARSHALL: But there is still --
18 (Simultaneous speaking.)
19 MR. MARSHALL: No. It's still Rev E.
20 MR. BROWN: Yeah, I've got a copy that's
21 unredacted that's a -- but the Rev E is unredacted.
22 But the next version is redacted?
23 MR. MARSHALL: Well, no, no, no, no. The
24 NEI did provide us with public and nonpublic versions
25 of the document, but the public version has redactions

1 in it. So we do have access to the unredacted
2 document.
3 CHAIR ROBERTS: Oh, yeah, we do, too.
4 MR. MARSHALL: Okay.
5 CHAIR ROBERTS: The problem more is, like
6 I said at the outset, right now I'm very reluctant to
7 ask questions because so much of the document is
8 redacted.
9 MR. MARSHALL: No, the substantive part of
10 the document is not for public consumption. Most of
11 the stuff that is not redacted is discussion about
12 regulatory requirements, regulatory guidance. The
13 substantive parts of the methodologies is not for this
14 forum.
15 CHAIR ROBERTS: Is the intent that the Rev
16 0 will be similarly redacted, or is that something
17 you're working on?
18 MR. MARSHALL: Back on. Michael Marshall.
19 It is going to be a proprietary document, and so it
20 will have probably comparable redactions in it.
21 MR. BROWN: How useful is something that's
22 proprietary?
23 MEMBER KIRCHNER: Well -- this is Walt.
24 The second question is we have to ask ourselves --
25 we're talking about safety-related digital I&C

1 systems, so I'm assuming we're talking about the
2 reactor production system and the ESFAS systems.
3 The public needs to have a high level of
4 confidence these systems work. So the regulatory
5 guidance about how they work, if that's redacted or
6 proprietary, doesn't strike me as inspiring public
7 confidence.
8 MR. MARSHALL: This is Michael Marshall
9 again. NEI 20-07 is not regulatory guidance. NEI 20-
10 07 will be treated by the NRC as a topical report, as
11 if it was submitted by any old vendor. And so this
12 will be a methodology from NEI --
13 MEMBER KIRCHNER: But if you eventually
14 endorse it, you're saying, here's an improved
15 methodology for addressing common-cause failure in one
16 of the most important safety systems in a reactor.
17 And you're going to do this in a proprietary manner?
18 That's going to strike the public as not being very
19 transparent.
20 MR. MARSHALL: Well, it's limited. But
21 again, we do routinely -- and it's just not for
22 digital I&C -- review -- and in this case, it's not an
23 endorsement -- and approve generic methodologies for
24 use in licensing and design of power plants. This is
25 not unique to digital.

1 Again, it has proprietary information in
2 it that would be damaging to the organization --
3 (Simultaneous speaking.)
4 MEMBER KIRCHNER: We're fully aware of the
5 precedent with TRs. But you have an industry guidance
6 that you're going to apply to the fleet, and you're
7 going to endorse it in some manner by approving a TR,
8 or like a TR. And this is going to be a proprietary
9 document.
10 And it just strikes me that that doesn't
11 really provide much transparency for the public in
12 terms of the regulatory environment that's being
13 applied to digital I&C systems that are relied on for
14 the safety of the plant. It's an observation. You
15 don't have to address it in real time, but it would be
16 a concern, at least for this Member.
17 MEMBER MARTIN: You're not the only one,
18 Walt. I mean, transparency is key. I don't know how
19 you could have policy of any sort that wouldn't be
20 subject to public scrutiny. I mean, if someone sent
21 in a FOIA request, would they not have -- I mean, if
22 there's -- again, decisions are being made on safety
23 related to something that's endorsed by a reg guide --
24 MR. MARSHALL: This is Michael Marshall
25 again. We are not intending to endorse this document

1 through the regulatory guide process. We are
2 reviewing it as part of the topical report process,
3 which is an approval that will receive a safety
4 evaluation from the staff.
5 That safety evaluation will be public
6 explaining why we did or did not find this methodology
7 acceptable. So that will be made available to the
8 public. The material that is considered proprietary
9 will not.
10 Now, again, if a member of the public had
11 a concern with, let's say, an individual licensing
12 action that would rely on that methodology which is
13 separate from the review of the methodology, they
14 could make the case for having access to that
15 information if they are going to try to go into, let's
16 say, a hearing space.
17 There are provisions for that, for members
18 of the public to gain access to that type of
19 information. But again, they would have to go through
20 the process to gain access. But that would be done
21 separate on an individual licensing action, not part
22 of the topical report process.
23 MR. BROWN: But if you write an SE on it
24 which says this is a method acceptable, that's kind of
25 a back-door endorsement when you say that. And looked

1 at the unredacted version that I have -- it's 44 pages
2 worth of -- if I was an applicant, I would put this on
3 a shelf somewhere and not use it in the design of my
4 equipment. Could almost never get through all the
5 stuff that they've got in here and say, gee whiz, my
6 system needs all this.
7 I mean, it is -- by the time you finish
8 it, the plant will be built. I'm just really hung up
9 a little bit on some of these processes that are so
10 complex.
11 MR. MARSHALL: I guess just going to take
12 a stab at topical reports. Because we review and even
13 approve a topical report, we are not advocating the
14 use of the topical report or the methodology inside of
15 it. It is for that vendor to make it available to one
16 of their customers. In this case, NEI is acting as a
17 vendor, and so they'll make it available.
18 So our approval is not a recommendation to
19 utilities or members of the public that that
20 methodology should be reviewed. It is considered a
21 review efficiency, so when an individual comes back
22 either as part of license amendment or an operator
23 license submittal, we won't necessarily re-review the
24 methodology again because it already has a separate
25 safety evaluation.

1 And that safety evaluation is public. The
2 rationale for why we found it acceptable, or not
3 acceptable in some cases, is also public. Just the
4 details of the methodology is not public.
5 (Simultaneous speaking.)
6 MR. BROWN: -- if an applicant comes in
7 and says, hey, we've gone through this process in 20-
8 07 and everything works out okay, doesn't that then
9 say we expect NRC will not have any additional
10 comments and we can walk away from this? Does that
11 say you don't have to review it in your own manner
12 relative to your guidance?
13 MR. MARSHALL: It would have already
14 received a review with regards to our guidance. So
15 what the applicant or licensee would do at that point
16 would just make sure that since it's -- whatever the
17 generic applicability is -- let's say it just has to
18 be for PWRs.
19 If there are PWRs, it would be applicable
20 to them. Therefore, we wouldn't re-review it. If it
21 was guidance for a PWR and they were a BWR, we would
22 then do a separate review because that generic
23 applicability didn't apply to that. Of course, this
24 doesn't make sense for digital technology because it
25 doesn't care about the reactor type.

1 MEMBER MARTIN: Is there precedence for --
2 (Simultaneous speaking.)
3 CHAIR ROBERTS: Walt wanted to make a
4 comment. Let's let Walt talk.
5 Go ahead, Walt.
6 MEMBER KIRCHNER: Well, maybe I'm just
7 overreacting to the terminology. We are well aware of
8 how topical reports are entered into the system,
9 reviewed, SE is issued, et cetera, and respect all
10 that. That's not the issue.
11 What I'm reacting to is this view graph
12 says NRC Endorsement. So, if you're endorsing what is
13 a standard, so to speak, much like you did endorse 18-
14 04 for the LMP process, that's a different issue than
15 a proprietary topical report that has information that
16 a vendor is protecting for whatever reasons.
17 If this is regulatory process, it behooves
18 the Agency to have transparency. If this is some
19 proprietary approach to designing digital I&C system,
20 I get it. I understand that. And that should be
21 protected.
22 MR. MARSHALL: I understand the question.
23 When NEI did provide the document to us and when they
24 stated what their intent is, they did want us to
25 endorse this document under the regulatory guide

1 process. After internal consideration, we decided
2 that was not the appropriate process to handle NEI 20-
3 07 under.
4 And we have communicated verbally to NEI
5 that we are treating 20-07 as a topical report. So
6 the endorsement is what NEI requested, but we're
7 treating it not like a document that would be endorsed
8 through the regulatory guide process; we've decided to
9 treat it as -- because it's more appropriate to do so
10 as a topical report.
11 So we're not using the word, endorsement,
12 going forward. That's what was requested by NEI.
13 MEMBER KIRCHNER: Okay. I was just
14 reacting to the view graphs here. Thank you for the
15 clarification.
16 MEMBER MARTIN: A good word.
17 CHAIR ROBERTS: Okay. I think that's
18 enough discussion. You all need to work through how
19 to best deal with the fact that NEI wants to hold this
20 material proprietary. And that's their call, right,
21 to hold it proprietary.
22 And what that means in terms of
23 transparency is something that needs to be considered.
24 I think we all have a view that saying the digital
25 I&C system is okay because -- go check in secret

1 document -- is not transparent. And so have to figure
2 out how to best deal with that. And that's, yeah,
3 your all's job.
4 Back to Samir.
5 MR. DARBALI: Thank you. And thank you,
6 Michael, for the clarification on that sample.
7 Okay. On slide 26, regarding generic
8 communications, the staff is developing a regulatory
9 summary, or RIS, to highlight the benefits of pre-
10 application communication and scheduling for digital
11 I&C licensing actions. This RIS was issued for public
12 comments in December of 2023, and the NRC is seeking
13 scheduling information for pre-application activities
14 and submittal of applications to help inform the NRC's
15 budget and resource planning.
16 Voluntary information that is requested
17 includes the estimated time frame for license
18 amendment request submittal and pre-application, the
19 plan systems to be upgraded, the I&C platforms to be
20 used, and the intended ISG-06 licensing process.
21 Next slide.
22 So now we're going to go over the
23 licensing and topical report activities. We're going
24 to start with the operating reactor modernization,
25 which will include a brief discussion of the ISG-06

licensing process and the current licensing applications. And then we'll go over to the new and advanced licensing activities and the topical report.

CHAIR ROBERTS: Just looking ahead and maybe looking to you guys for guidance, it looks like there's no natural break in the next several slides. So is this a good time to break for lunch?

MR. DARBALI: We can break now, or we can break when we finish the operating reactor modernization, and then we resume with the new and advanced reactors.

CHAIR ROBERTS: Okay. So you think that will take on the order of 25 minutes to get through?

MR. DARBALI: I think so. Yeah.

CHAIR ROBERTS: Okay. Let's move on.

MR. DARBALI: Okay. So I'll be brief. Most of what I'm going to talk about now is a summary.

Okay. So ISG -- we're on slide 28. So ISG-06 is tied to licensing processes, the traditional tiered review process, also called the Tier 1, 2, and 3 review process, and the alternate review process, which was introduced in Revision 2 of the ISG.

This here shows, at a high level, those steps that take place before determining which of the ISG-06 licensing processes will be used to review a

licensing application.

We start with pre-application meetings with the applicant to determine the scope of the review, the information that will be provided based on the intended licensing process, and where the application will be in the development process at the time of submittal.

After pre-application engagements, the applicant submits the license amendment request, and the staff performs the acceptance review. And it is at that time that the staff makes the determination of which of the two licensing processes will be used to perform the licensing review.

CHAIR ROBERTS: Yeah, Samir, I didn't see anything in the presentation that defines what the traditional Tier 1, 2, and 3 review process is. Can you give a quick synopsis of what that is?

MR. DARBALI: So the next slide covers that.

CHAIR ROBERTS: Okay. Yeah, I didn't see it.

MR. DARBALI: Yeah. Okay. So, under the tiered review process, the license amendment is typically issued after factory acceptance testing. And this is followed by inspections of site acceptance

1 testing and site installation.

2 Under the alternate review process, the

3 license amendment is typically issued before the full

4 implementation and testing of the design. And

5 therefore, oversight of factory acceptance testing is

6 performed via inspection.

7 For both processes, this fast review is

8 based on the evaluation of the use of a pre-approved

9 platform as well as the new design system

10 architecture. The main difference is that under the

11 tiered review process, the focus is on the new system

12 design outputs, whereas under the alternate review

13 process, the focus is on the development plans and

14 processes, including the licensee's vendor oversight

15 plan as well as any licensee commitments to implement

16 those plans.

17 One thing we have noticed in our review of

18 recent applications that use the alternate review

19 process is that in reality, those applications

20 actually fall somewhere in between the two processes

21 in terms of what information is provided when the

22 license amendment request is submitted, what

23 supplemental information is provided, and when it is

24 provided.

25 The next few slides also cover the

1 differences between the two processes.

2 CHAIR ROBERTS: So what are Tiers 1, 2,

3 and 3?

4 MR. DARBALI: Oh. Sorry.

5 So Tiers 1, 2, and 3 are defined based on

6 how much they credit or use a pre-approved topical

7 report platform. So a Tier 1 review is one where the

8 licensee is using a pre-approved platform topical

9 report with no changes to that application.

10 MR. BROWN: Like the Common Q or one of

11 the other ones that's been used?

12 MR. DARBALI: Correct. Yeah. Common Q is

13 a good example.

14 MR. BROWN: Okay.

15 MR. DARBALI: The Tier 2 process is one

16 where the applicant is using a pre-approved platform

17 topical report but with some changes. So that might

18 involve a new methodology, a new component that hasn't

19 been reviewed.

20 So it's a pre-approved platform, but there

21 are changes. So that just means at the time of review

22 of the license amendment request, we are performing

23 additional review for those new aspects.

24 And then a Tier 3 application is one where

25 it's not referencing a pre-approved topical report.

1 So the licensing review not only includes the
2 application platform but the entire review of the
3 feasibility of that platform itself. So it's a
4 lengthier review. And the whole idea is to help
5 identify how streamlined that licensing review can be.
6 CHAIR ROBERTS: In comparing the two
7 processes, is there a good analogy as a 10 CFR 50
8 versus 52? Because 52, you would have -- give a
9 combined license, but you'd have a whole bunch of
10 those ITAACs that would need to be validated as you
11 go. So that's kind of what I read when I looked at
12 those.
13 MR. DARBALI: There are some parallels.
14 But obviously, when we do an evaluation under the --
15 well, when we look at previous reviews -- and I think
16 Oconee and Diablo Canyon -- well, Oconee was pre-ISG-
17 06. Diablo Canyon did use the first revision of ISG-
18 06.
19 That type of review focused on not only,
20 for software development, looking at the planning, so
21 the planning parts of BTP 7-14, but also looking at
22 the design outputs and the implementation activity.
23 So we were looking at the plans for software
24 development, the implementation, and we're looking at
25 the factory acceptance testing.

1 And we realized, well, if you're looking
2 at the factory acceptance testing and the IV&V
3 results, well, the planning is not as important. And
4 so that's what Tier 1, 2, and 3 look like now.
5 And the opposite end is, if you have good
6 plans and good commitments or licensee performs the
7 proper oversight of the vendor that those plans are
8 going to be implemented, then we can move -- we have
9 reasonable assurance that we're looking at a design
10 that's acceptable, and we have reasonable assurance
11 that it's going to be implemented per the license
12 amendment request and the plans.
13 And we can make our safety determination
14 based on that, and we can shift the oversight of
15 implementation and factory acceptance testing to an
16 inspection activity.
17 So there are some problems for 52, but
18 they're not quite exactly saying we can't use ITAACs
19 and so on.
20 CHAIR ROBERTS: Now, just to make sure I
21 understood the principle -- so the principle is, once
22 you're done with the alternate review process, you're
23 not done, right? You still got inspections that
24 you'll do --
25 MR. DARBALI: Correct.

1 CHAIR ROBERTS: -- to go validate that the
2 licensee applicant, or whatever, has done what he said
3 and the ultimate design meets all the principles.
4 MR. DARBALI: Correct. One of the drivers
5 for the alternate review process was feedback from
6 industry that they had to commit so many resources
7 before they got approval of the design change.
8 So what that means is -- okay, and now
9 with the alternate review process, that approval comes
10 in earlier. But some of the project risk now shifts
11 to that licensee, whereas with the tiered review
12 process, they are in the implementation phase or
13 factory acceptance testing. And then, if they
14 identify that they need to do a design change, they
15 can just go back, do the work, resubmit that
16 information to the staff. The staff reviews it, and
17 it's all part of licensing review.
18 If the licensee were to do those changes
19 after the license amendment is issued, then they
20 either have to go back and do another license
21 amendment request that's a lengthier process, or if
22 the staff finds something during inspection, then that
23 leads to a possible -- could be a possible violation
24 or a finding.
25 But the staff's overall oversight of the

1 entire process remains the same.

2 CHAIR ROBERTS: Okay. Thanks.

3 MR. ROGGENBRODT: This is Bill

4 Roggenbrodt. Just to add to that, this has been

5 communicated to the industry on multiple occasions

6 with the alternate review process, is that the level

7 of regulatory review and rigor is not diminished by

8 the alternate review process.

9 It's just shifted, as Samir said, to an

10 inspection organization that may and often does use

11 the resources within our branches as technical

12 experts, technical authorities, so that if there's

13 issues found or a violation may be present, they're

14 still going to need to be addressed.

15 But as Samir pointed out, industry was,

16 again, the catalyst saying, well, we've invested so

17 much. Could we get something approved earlier in the

18 development process? And saying we'll do that, but

19 the level of rigor is not going to change.

20 MR. DARBALI: And again, these two

21 processes are -- the way they're defined is how

22 they're defined in the ISG, which kind of envisions

23 the ideal case or model case for the two processes.

24 And what we've seen in recent

25 applications, the application -- although it may be

1 submitted with the intent to follow the alternate
2 review process, it typically falls somewhere in
3 between. And that's okay. The staff adjusts to that
4 and has been able to accommodate those differences.
5 But it doesn't really impact our ability
6 to do our licensing review. It may challenge it at
7 some times, but we are able to do those reviews.
8 We can go to slide 30.
9 So this slide identifies those technical
10 review areas identified in ISG-06. All of these areas
11 apply to both licensing processes, except for three
12 that are identified here.
13 But the staff reviews, again, for both
14 processes, the new system architecture, and this
15 includes the new system functions, system interfaces,
16 and how the design meets the fundamental design
17 principles of redundancy, independence, deterministic
18 behavior, defense-in-depth and diversity, and control
19 of access. The staff also reviews the hardware
20 equipment qualification.
21 Now, for the tiered review process, like
22 I said earlier, the staff review focuses on the system
23 and software development outputs. For the alternate
24 review process, the staff's review focuses on the
25 system and software development processes and plans as

1 well as the vendor oversight plan.

2 For both processes, the staff reviews how

3 a previously approved topical report platform is

4 applied, as well as compliance with IEEE 603,

5 conformance with IEEE 7-4.3.2, tech spec changes, and

6 the secure development and operational environments.

7 And next slide. And this is a figure from

8 the ISG, and it identifies the applicable sections for

9 the two review processes. On the left are the

10 oversight section, ANBR introduction and purpose.

11 Section C defines the two processes. Section C-1 on

12 the left provides the sections of the ISG that are

13 applicable to the tiered review process. And the

14 boxes on the right are for the alternate review

15 process.

16 Each of these sections in the ISG identify

17 the applicable regulatory criteria, the applicable

18 regulatory guidance, and the applicable industry

19 standards. So the basis for staff's evaluation is

20 captured in all of those sections.

21 Okay. Next slide. Okay. And so this

22 slide, 32 -- we developed this as we were developing

23 the mapping diagrams that we showed last year. Those

24 big circles are the -- they're the eight technical

25 areas for I&C. Cybersecurity is outside of the

1 licensing review. It's not part of our Part 50
2 review. So we only have the eight here. But those
3 aspects of security are captured when we talk about
4 secure development and operational environment.
5 And so what this slide does is it shows
6 the ISG-06 sections that fit into those technical
7 areas. And you can see some overlap between ISG-06
8 sections applicable to the criteria for safety systems
9 and criteria for safety system programmable digital
10 devices.
11 That's because, oftentimes, it is through
12 the review of the programmable digital device features
13 and architecture that you kind of meet the criteria
14 for safety systems in 6-03.
15 But this kind of helps staff understand
16 how the particular sections in the ISG fit into the
17 overall regulatory infrastructure. And if the staff
18 needs to go back to those detailed diagrams, they can
19 see the applicable criteria and guidance.
20 MR. BROWN: I'm just going back and look
21 at the 2018 letters and your all's multiple responses
22 because we had a concern on control of access -- was
23 totally eliminated from the ISG. And your response
24 was it was not appropriate, couldn't give adequate
25 guidance because NSIR does this, that, and the other

1 thing.

2 But we were still in that -- that happens

3 after the equipment's totally designed and is now

4 ready to put in. But you made a comment a minute ago

5 that control of access was now included. Is that

6 right, wrong, or am I --

7 MR. DARBALI: Right. So control of access

8 -- it has always been in 603 and 7-4.3.2. And when we

9 developed ISG-06, the secure development and

10 operational environment, which covers -- secure

11 development covers everything that happens at the

12 vendor, and secure operational environment covers how

13 that system is integrated into the plant and the

14 safety features -- or security features, rather --

15 that are implemented by the plant to ensure the

16 integrity of the system is not affected during

17 operation.

18 So that can involve key locks on the

19 platform, lock --

20 MR. BROWN: Physical?

21 MR. DARBALI: Physical, but also data. So

22 you can't connect a maintenance workstation to make

23 changes while the channel is operable. You've got to

24 go into maintenance bypass. So, I mean, these are

25 features that are platform-specific and application-

1 specific.

2 But the idea is that no unintended and

3 undecided changes can take place during system

4 development and during system operation. Licensees

5 often will credit their cybersecurity controls when

6 they're trying to meet the secure development and

7 operational environment criteria. So --

8 MR. BROWN: But this isn't -- that's a lot

9 of word salad you just went through. I wanted to put

10 that in perspective because there's -- in your all's

11 response to us back in -- I think it was November or

12 something like that, of 2018, you also incorporated --

13 there was some more word salad that you put in.

14 But it all was reference to end rating,

15 relatively, because it didn't apply -- it seemed to be

16 in contrast to what we now have in 1.5, whatever it

17 is, and to what is in 5.71, that say the architecture

18 has to include the control of access and the use of

19 hardware-based -- unidirectional are acceptable for

20 use during the design development of these systems.

21 MR. DARBALI: Right.

22 MR. BROWN: So there seems to be a big

23 disconnect now between ISG-06 -- this is Rev 2, I

24 believe, right?

25 MR. DARBALI: Yes.

1 MR. BROWN: Okay -- and what's out there.
2 I mean, you went through two pages of wordsmithing
3 about NSIR doing this and doing that --
4 MR. DARBALI: Yes.
5 MR. BROWN: -- your SDOEs, which --
6 controlling something at the vendor or at the
7 applicant's plant is useless relative to what he has,
8 what you put in the plant. And now you're sending
9 data out to the main control room or out to the
10 internet, and you're doing it through evaluational
11 devices.
12 So there seems to be a big gap in this ISG
13 right now relative to the overall architecture --
14 MR. DARBALI: Well --
15 MR. BROWN: -- and what you would be
16 actually reviewing when you get the license amendment
17 request to do this.
18 MR. DARBALI: So what I'm trying to get at
19 and maybe I didn't get to, I guess -- when we did the
20 ISG and we included the secure development and
21 operational environment criteria, we're pointing to
22 the criteria in Reg Guide 1.152, Revision 3, because
23 Revision 3 contained all the SDOE criteria.
24 And yes, the ISG does say this is
25 intended/this is not intended for cybersecurity. For

1 cybersecurity, go look at 5.71 -- something to that
2 effect. And then I think Revision 3 or Reg Guide
3 1.152 says this is all for non-malicious.
4 When Revision 4 of Reg Guide 1.152 was
5 issued last year, it removed all of the SDOE criteria
6 from the Reg Guide because it is now in the 2016
7 version of 7-4.3.2, which it endorses. So that
8 criteria is now in the standard. And yes, there --
9 Revision 4 of 1.152 does provide -- yes, it provides
10 a pointer to 571, and that's the difference.
11 It does put the example of one-way
12 communication, unidirectional communication, as a way
13 to ensure that level of control of access. Yes. That
14 is one difference. But ISG-06 -- it still points to
15 7-4.3.2. So -- sorry. It still points to Reg Guide
16 1.152.
17 And so Revision 4 does capture that
18 unidirectional communication message. So I don't
19 necessarily see it as a gap.
20 MR. BROWN: Well, we were still arguing
21 about hardware-based back and forth. This was before
22 5.71 got revised.
23 MR. DARBALI: Correct.
24 MR. BROWN: And so I'm worried about the
25 disconnect now with what we've got out there and while

we -- because 5.7 -- you miss -- all those just keep talking about NSIR and all this other -- 5.7 and Part 50.71 or 73, whatever it is.

And it just seems like it's a giant hole such that we -- the vendor ends up delivering equipment that doesn't have hardware-based, unidirectional communications from the critical safety systems to the main control room or other type locations. So they are susceptible to whatever network that people set up in the rest of the plant.

DR. BLEY: Charlie, can I sneak in a question?

MR. BROWN: Yeah.

DR. BLEY: Yeah, this is Dennis. If I followed the kind of lengthy walkthrough over the guidance, I think what I heard was you have to protect the data, and a hardware unidirectional device is one acceptable way to do that, leaving the door open to almost anything else. Did I misunderstand?

MR. BROWN: 5.71 was that --

DR. BLEY: I was really asking the staff on that one, Charlie.

MR. BROWN: Oh. I'm sorry. I thought you were talking to me.

MR. DARBALI: And please direct me if I

1 don't answer your question, but right, the criteria in
2 the ISG and the pointer -- really, the ISG doesn't
3 have criteria. The ISG points to the criteria. And
4 so, for secure development and operational
5 environment, it points to the criteria in Reg Guide
6 1.152, Revision 3.
7 The intent of that is to protect the
8 safety system, not only physically but also as far as
9 data is concerned, to ensure the safety function is
10 not impacted. In addition to that, we also have ISG-
11 04, which provides that data independence and
12 integrity criteria.
13 So it's all to ensure that a non-safety
14 system cannot affect a safety system's ability to
15 perform the safety function.
16 DR. BLEY: But nothing there, from what I
17 hear, precludes using software or something else other
18 than a hardware unidirectional device. You're not
19 requiring a hardware unidirectional device. You're
20 just saying it's one way to protect the system.
21 MR. DARBALI: That is correct.
22 DR. BLEY: Okay. That's what I wanted to
23 get to.
24 MR. DARBALI: Yeah. Right. That's
25 correct.

1 MR. BROWN: That's what 5.71 says also.
2 It does not dictate -- it said this is an acceptable
3 method for precluding external access, electronic
4 access. But if you read your all's -- back reading
5 your all's response on -- this is nine pages' worth of
6 stuff getting wrapped around the axle. That paragraph
7 -- I had it -- my point being is this: Rev 2 is -- oh,
8 it's -- the regulations do not require licensees to
9 include cybersecurity features, hardware/software and
10 safety-related systems/features intended.
11 That's Rev 3 of 1.152 has that as a
12 footnote. Okay. Now, Rev 4 is out now.
13 MR. DARBALI: Yeah.
14 MR. BROWN: Is that -- I thought we fixed
15 that in Rev 4.
16 MR. DARBALI: Right. There is a --
17 MR. BROWN: But ISG-06 is still governed
18 -- does Rev 4 actually now provide the guidance that's
19 really going to be addressed? And ISG-06 is just
20 absent that update at the current -- is that -- Rev 2
21 doesn't have?
22 MR. DARBALI: Right. Right. Rev 2 --
23 MR. BROWN: Rev 2 says all kinds of stuff
24 about you don't have to even think about it.
25 MR. DARBALI: Rev 2 --

1 MR. BROWN: That's what you said in your
2 response to it.
3 MR. DARBALI: Rev 2 doesn't consider --
4 right -- the malicious aspects --
5 MR. BROWN: Of external electronic access.
6 MR. DARBALI: But the secure development
7 environment --
8 MR. BROWN: But that's at the -- I have
9 that does not get you --
10 MR. DARBALI: Secure development
11 environment requirements in Rev 3 do talk to that you
12 cannot have remote access or access external to the
13 safety system or to the plant. So --
14 MR. BROWN: That's to the plant, I think.
15 MR. DARBALI: Right.
16 MR. BROWN: But that's all been here.
17 SDOE is all back in -- still back in the applicant's
18 design area.
19 MR. DARBALI: The language added to
20 Revision 4 of 1.152 does provide that example of one-
21 way unidirectional communication. Right. ISG-06 has
22 not been revised since 2018. The staff is trying to
23 gather lessons learned from its applications and the
24 licensing reviews we have.
25 So, at some point, the ultimate place for

1 that guidance in ISG-06 is in the SRP. So, at some
2 point, we're going to get those lessons learned and
3 improvements. And so we're going to move that
4 guidance.
5 So, right, ISG-06 is still interim. But
6 it's a pointer to the criteria that -- it's either in
7 Reg Guide 1.152 or in 7-4.3.2. And so I think the
8 concern is addressed by using the Revision 4 of 1.152.
9 MR. BROWN: Yeah, but the reference for 7-
10 4.3.2 was 2003 that was thrown around --
11 MR. DARBALI: Right.
12 MR. BROWN: -- like candy at a child's
13 party in that back and forth that we had then. So now
14 we're up to -- what's the version of -- up to 2018 or
15 something?
16 MR. DARBALI: 2016.
17 MR. BROWN: '16. Sorry.
18 MR. DARBALI: Yeah.
19 MR. BROWN: So you got a hole.
20 MR. DARBALI: It's not up to date.
21 MR. BROWN: All right. We can quit. I
22 just won't be here to harass you, though.
23 MR. DARBALI: Okay.
24 MR. BROWN: That's very important, by the
25 way. That's a giant difficulty in all of the

1 documentation right now. And I'm just a consultant
2 speaking to you right now. This is not a position for
3 anybody other than me.
4 MR. DARBALI: Right. Thank you. So I'm
5 done with my slides.
6 CHAIR ROBERTS: Yeah, we are pretty much
7 on time, three minutes over your estimate.
8 MR. DARBALI: So I --
9 PARTICIPANT: We'll chalk that up to
10 Charlie's harassment.
11 MR. DARBALI: Yes. Right.
12 MR. BROWN: That was constructive
13 dialogue.
14 MR. DARBALI: Good conversation. So
15 right. The upcoming slides, which I guess we can do
16 after lunch, still will cover the current licensing
17 activities that we have for operating plants, and
18 we'll move on from there.
19 CHAIR ROBERTS: Based on slide numbers,
20 we're making pretty good progress on the schedule. So
21 let's go ahead and take a break for lunch until --
22 let's call it 1:15 Eastern Time. And then we'll come
23 back at 1:15.
24 (Whereupon, the above-entitled matter went
25 off the record at 12:04 p.m. and resumed at 1:15 p.m.)

1 CHAIR ROBERTS: We're back in session,
2 coming back from the lunch break. In terms of a
3 quorum, I see that Walt Kirchner and Vicki Bier are
4 online. Will you confirm you're there?
5 MEMBER KIRCHNER: Here, here, here,
6 Thomas.
7 CHAIR ROBERTS: Okay, thanks, Walt. So we
8 have a quorum, and let's move on.
9 Samir, is somebody else new?
10 MR. DARBALI: So, I will now turn it over
11 to Bill Roggenbrodt, who will talk about our framework
12 licensing.
13 CHAIR ROBERTS: Okay, thanks.
14 MR. ROGGENBRODT: Good afternoon, my name
15 is Bill Roggenbrodt. I'm here today to discuss the
16 current state of the operating reactor licensing
17 reviews.
18 First, take a look at the planned digital
19 I&C upgrade of Turkey Point. As the slide states, the
20 licensee submitted a License Amendment Request in 2022
21 that would encompass several parts of the control room
22 being modified to replace analog portions of the I&C
23 system with digital upgrades.
24 The new I&C system will be based on the
25 Framatome Tricon V10 platform Topical Report, which

1 was approved by the NRC in April, of 2012. Earlier
2 this month, the licensee withdrew its License
3 Amendment Request, and as of this date there's not a
4 planned resubmittal date for this analog to digital
5 I&C upgrade. Next slide, please.
6 Also in 2022, Limerick Units 1 and 2
7 submitted a License Amendment Request for an analog
8 digital upgrade that included its reactor protector
9 system, nuclear steam supply shutoff system, and
10 emergency core cooling system. The new I&C system is
11 to be based on Westinghouse's Common Q system, whose
12 Topical Report was approved most recently in April
13 2021.
14 The staff continues to work on completing
15 its licensing review, and is currently reviewing the
16 most recent round of RAI responses from the licensee.
17 As stated on the slide, the current plan's for the
18 licensee to install the plant protection system in a
19 Unit 1 outage in 2026 and a Unit 2 outage in 2027.
20 Next slide, please.
21 Peach Bottom, moving on to the -- Peach
22 Bottom, the staff conducted a pre=application meeting
23 with the licensee last month. During the meeting, the
24 planned particulars of the modification were
25 discussed. The current compensated level system is a

1 Foxboro Spec 200, which is being replaced by a
2 Curtiss-Wright digital safety system based on the
3 RadICS platform.
4 The latest version of the FPG-based
5 version of the RadICS Topical Report was approved by
6 the NRC in June of 2020. The system replacement will
7 impact the emergency core cooling system and post-
8 accident monitoring system.
9 Now I'll turn the presentation over to
10 Dinesh.
11 Dinesh?
12 CHAIR ROBERTS: Bill, for perspective, is
13 this the kind of throughput you've been seeing in the
14 operating reactors? That's a grand total of three,
15 one of which has been withdrawn. And so I guess
16 sounds great, but that seems like a pretty low
17 throughput. Is that typical in terms of the number of
18 applications that got for review in a given time?
19 MR. ROGGENBRODT: It is typical, and
20 again, we're able to do what we're able to do in that
21 regard simply because of the -- and was stated earlier
22 -- competing priorities. So those are, you know,
23 what's in house in that regard. And there's -- trying
24 to think what other planned updates are in the works.
25 Yeah, there's also one other that I can think of.

MR. MARSHALL: Besides -- all right, this is Michael Marshall. Besides the Peach Bottom one, we're aware of one other licensee that's considering a submittal. But the submittal probably wouldn't be until 2025 -- 2026, actually.

So right now if you're asking what we're averaging, we're probably averaging one at a time. And it doesn't -- it's not clear if that's going to pick up in the near future.

That's one reason we're looking for issuing that risk, so we can get some sort of expectation of what type of -- how many submittals we might get longer term out.

One thing we're learning is that it takes a bit of effort on the licensee side, especially with the changes that FP&L and Constellation are considering, to the do engineering work then put together a licensing action. So that appears to be a multi-year effort.

MR. TANEJA: And also, one other observation is that the Limerick modification is the DOE, you know, Operating Reactor Sustainability Program, right? Light water reactor sustainability program, so they're supposed to be publishing the finding of this methodology and create a standardized

path forward for the other applicants, other licensees to follow.

So I think it may be that people are waiting to see how Limerick proceeds, and then maybe use that as, you know, example moving forward.

PARTICIPANT: Okay, thanks.

MEMBER HALNON: Hey, Tom, this is Greg Halnon. How are you all, from the staff perspective, guarding against what we've often called regulatory creep? You know, probably largely seen in the license renewal area, you know, where the first application was 100 pages, and now we're talking thousands and thousands of pages.

But are y'all aware, I mean, are you considering that piece of it as you get lessons learned? Because that's a real danger here for, you know, first-of-a-kind type submittals like these. And especially when the licensees are sitting back and watching. What they're watching for is exactly that, what will be the base level requirement.

MR. DARBALI: So, right. This is Samir. We've been aware of the length of our Safety Evaluations for a while. And part of what we're trying to do with ISG-06 is be more concise in our Safety Evaluations, more to the point of what the

1 change is and the safety impact and how it meets the
2 regulatory requirements.
3 So we are aware of page count. Not that
4 that is the driver for Safety Evaluations, but it's
5 more of we want to be consistent with how we're
6 applying our regulatory guidance. And we want to
7 create a model basically of how our Safety Evaluations
8 look and to ensure consistency.
9 CHAIR ROBERTS: Okay. Are you continuing
10 to hold workshops and whatnot with the industry to
11 make sure everyone's on the same page?
12 MR. DARBALI: Yes. I don't think we had
13 one last year, but there is industry interest in
14 having one this year. So we are working with our
15 counterparts to plan for that.
16 CHAIR ROBERTS: Okay, thanks, I'll watch
17 for that. Appreciate it.
18 MR. DARBALI: Thank you.
19 MR. PAIGE: This is Jason, can I just add
20 one more thing? So you know, there is a fine line in
21 terms of how much information to include in the Safety
22 Evaluation to be clear on how we make our regulatory
23 decisions. But I'll just add this kind of circles
24 back to the earlier discussion we had regarding
25 transparency.

1 So you know, the level of detail that we
2 include in our Safety Evaluations is, you know, to be
3 transparent on how we came to our conclusions. So
4 there's a fine line of how much is too much or too
5 little in Safety Evaluations.
6 CHAIR ROBERTS: Yeah, thank you, Jason.
7 I appreciate you being aware of that.
8 MR. ROGGENBRODT: This is Bill. One other
9 item that comes up, not often but often enough, is the
10 Safety Evaluation doesn't just sit on the shelf, it's
11 looked at by licensees and goes forward. But then
12 it's looked at at other licensees, and as the
13 technology changes, you have some systems that were
14 completely software-based that are not digital
15 programmable device-based.
16 So they'll point back to the original
17 Topical Report or one of the supporting documents. So
18 it's also important from a legacy standpoint to have
19 enough information so the individual that gets
20 assigned with Rev. 1, if you will, of the system, that
21 he or she doesn't have to go through and reinvent the
22 wheel. That enough information is there to, you know,
23 point them in the right direction or maybe the
24 determination that, yes, there was an evaluation done
25 in this area, you don't need to reexamine.

1 So, again, it's a balancing act, to
2 Jason's point.
3 CHAIR ROBERTS: Right, I appreciation
4 that, Bill. And this does have, you know, hints of a
5 nth of a kind type of review where, you know, you get
6 a reactor protecting system replaced by a certain
7 vendor's technology. The second one coming in should
8 not take the same level of review if it's a like
9 application, recognizing there are some, you know,
10 plant-specific issues you got to look at.
11 So that's kind of where I was getting to.
12 It should be less review required going forward as
13 opposed to more reviews as required. And that's the
14 regulatory creep I was trying to explore a little bit.
15 MR. DARBALI: And this is Samir. And we
16 agree with the nth of a kind approach. What we're
17 experiencing now with the recent applications that we
18 have in house and the ones that we're expecting is
19 every one -- every one of those is really a first of
20 a kind.
21 CHAIR ROBERTS: Right, we're clearly on
22 the front end of it. I agree with that, yes.
23 MR. DARBALI: Yeah. So we look forward to
24 the day when we can streamline our reviews, consistent
25 platforms are being used for consistent applications.

1 So yeah, thank you.

2 CHAIR ROBERTS: Yeah, that was an aspect

3 of Limerick, Dinesh, I hadn't really appreciated. So

4 is the intent to think about how to get to nth of a

5 kind, have a thought process from Limerick? Or is

6 that -- is that beyond what their goals are?

7 MR. TANEJA: Well, you know, I think

8 that's where DOE funding this exercise to basically

9 set up a pilot, essentially, to work in a -- as an

10 example of (audio interference). And, you know, we

11 expect that subsequent license renewals, we expect all

12 these licensees would do major upgrades to their

13 plans.

14 Because I think one of the thing that, you

15 know, the DOE study is trying to establish is that,

16 you know, you can economize your plant operation by

17 going fully digital and all that kind of stuff and

18 take advantage of the technology. So we expect that,

19 but right now, you know, I mean, we are in standby

20 mode.

21 Not that I'm saying that we have a lot of

22 spare resources. We are busier than anything, you

23 know. We, you know, we are full up loaded with work.

24 But if it comes in, we'll deal with it, you know. But

25 like I said, you know, there is nothing on the horizon

in the near though. There's some people are talking about it, but.

CHAIR ROBERTS: Okay, thank you.

MR. ROGGENBRODT: This is Bill. And just to add on, you're pointing out Limerick using a Common Q platform. Well, that's already been evaluated at some level for the AP1000 review in Vogtle 3 and 4.

So they're taking advantage of that where, again, the -- a lot of the processes, the Topical Reports, they're applicable and they can, you know, move towards and reference earlier reports, whether it be for verification, validation, the design. Because it's already been reviewed by the staff.

So I would offer that. Again, that's a balancing act. So you have that in your back pocket so you don't need to review those areas again. But you also have the application's specific nature of the system and how it's being applied in that particular plant. So, again, balancing act.

MR. TANEJA: Okay, so we can start with you know, our effort in the new and advanced reactor area, on slide 36. So as we see that there is more and more work coming in in this area, and that's really gotten us pretty well involved now in different stages of the review.

1 So the guidance documents that we are
2 actually now using for the non-light water advanced
3 reactors, the LMP framework, Reg Guide 1.233 that
4 endorses the NEI 18-04. That really is the -- it sets
5 the kind of the framework for the DRG that we wrote
6 from the design review guide for the I&C. It really
7 is a -- the inputs for our review and all the criteria
8 for our review are driven by the LMP evaluations,
9 right.
10 So that Reg Guide is kind of important for
11 us. And then the content of application comes in in
12 the Reg Guide 1.253, you know, where the TICAP is
13 essentially setting. And so what we have with these
14 reg guides is now for the existing framework of the
15 applications, Chapter 7 has been dedicated to I&C.
16 What we are seeing in light water
17 reactor/non-light water reactor application that are
18 using the LMP framework, they can talk about I&C in
19 any chapter. There is no dedicated chapter to the
20 I&C, right. So we have seen, right now we are looking
21 at the application for Kemmerer.
22 And they have I&C right now talked about
23 in Chapter 6, Chapter 7. There's the safety functions
24 are discussed in I think Chapter 4 and 5 -- it's like
25 we started the review right now, but that's really

where the content of application is kind of giving us an idea where the information may be and all that type of stuff, right.

And then there's a bunch of ISGs that also kind of help us in the ARCAP and all that, you know, that content of application and what we expect to see in Construction Permit application in Part 50. And then of course the DRG.

DRG, the little bit of background on DRG. So the DSRS was written for the small modular reactor reviews. And essentially that effort was done because the Commission's direction was that, you know, for the small modulars, the staff should develop design-specific review standards.

So we took that opportunity and we -- for the Chapter 7 for the I&C review, we took a lot of the feedback that we received from the ACRS for the large light water reactor reviews and the SEs that we were producing that were massive. So that to focus on safety review, principal I&C design criteria as the primary focus of review.

And then you know, from there looked at regulatory compliance. And regulatory compliance was primarily focused on looking at IEEE 603 criteria's compliance. And then if there were any exemptions

1 request or any exceptions to that, they were very easy
2 to evaluate because you know, you really saw -- we put
3 the, you know, we put the responsibilities on the
4 applicant to demonstrate that that framework -- that
5 your plant is safe.
6 And what are your arguments, what are your
7 design that demonstrates that your plant is safe,
8 right? So that's your Principal Design Criterias gave
9 us that assurance. Looking at the architecture,
10 drawing the boxes around the interfaces between
11 safety/non-safety, control room, you know, all the
12 operator actions that are involved in that.
13 So we were able to really just by
14 examining at that level reach very high confidence
15 that the plant is built as basic design to be a safe
16 plant. So naturally, you know, regulatory compliance
17 review became quite a bit easier.
18 I think the example was that for NuScale
19 review, for the design cert, our SE was about 150
20 pages, as compared to two-, three-hundred pages that
21 we used to do. And we only had two RAIs during the
22 whole process, and it was very efficient. I don't
23 have the numbers in front of me, but the time that it
24 took us to do that, it was very, very efficient.
25 MR. BROWN: Is that the I&C part?

1 MR. TANEJA: I&C part, right, yeah.

2 MR. BROWN: That was very small relative

3 to --

4 MR. TANEJA: Relative to, right. So we

5 took that approach as a, you know, as a stepping to

6 develop the DRG. So the only really, you know, I took

7 the feedback from the ACRS that all these guidance are

8 technology-inclusive, so why are we saying that this

9 is for non-light water reactor and this is for SMR?

10 The difference is the current structure of

11 the SRP, there were have it divided up in certain

12 sections. It supports our review as a guidance to do

13 the small License Amendment Requests that are coming

14 in from operating reactors. It serves us very well.

15 But when we are doing a complete plant

16 review, then the framework of DSRS really serves very

17 well, you know, it's like if you're looking at the

18 entire plant.

19 And for the non-light water reactor that

20 are using the LMP framework, the only delta is that,

21 you know, the requirements for the specification of

22 the I&C are driven by the determination of the, you

23 know, the licensing basis events, determination of the

24 required safety functions, determination of the risk-

25 significant functions, and determination of the SSCs

that are going to be relied upon to perform those functions. And then basically determining, you know, the safety classification of them.

So once we know all that, then we know exactly what is our review focus. So, once we get to that, then the real I&C is essentially the same. We start with the Principal Design Criterias, and then we look at all the elements of redundancy, independence, you know, dependability, and adequate defense-in-depth, and all these elements.

So, yeah, the review is, you know, it's just the, you know, the requirements that drive what we need to look at just come from the LMP, PRA, and whatever that takes place, that precursor to that that we look at.

DR. BLEY: Dinesh? Dennis Bley.

MR. TANEJA: Yes.

DR. BLEY: Everything you said makes sense to me, but now you're at this point. I didn't hear anything that would change my opinion that we ought to take off the new or advanced reactor label on these things and apply them across the board.

And you seem to be saying the same thing, although you're saying they've been very useful on the new designs. But we expected that to be true.

1 CHAIR ROBERTS: And Dennis, I have a
2 similar question, which is the reliance on LMP. Now,
3 I'm not sure I'm saying the reliance with LMP, because
4 that would take away the ability to apply the DRG to
5 non-light -- to light water reactors.
6 And it would also -- that's a -- raise the
7 question of whether if somebody didn't want to use LMP
8 but some other process for a non-LWR, you know, would
9 that require a different DRG? I wouldn't think so.
10 It seems like from the slide they're all linked.
11 MR. TANEJA: Yeah, so now that, you know,
12 I mean when we developed the DRG the intention was
13 that, you know, how are we going to really look at the
14 I&C architectures for the non-light water reactors.
15 So we are -- we were looking at the LMP framework, you
16 know, and how are the inputs are going to come in.
17 Now, we could make a technology-inclusive
18 review document that the only difference would be is
19 that you know, how, you know, like right now on light
20 water reactors, we rely on Chapter 15 safety analysis,
21 heavily rely on that to determine.
22 So when we look at the 603 Class 4, it
23 essentially drives us to go look at Chapter 15 safety
24 analysis to see what are the safety functions, what
25 are the SSCs relied upon. And if we take credit for

1 that in Chapter 15, that automatically classifies them
2 as safety-related.
3 So that's the way we basically get our
4 input for what is required for the I&C system to
5 perform. What functions are required and how they're
6 allocated to, you know, in a different I guess
7 subsections of the safety systems.
8 So that's really, you know, the delta is
9 that that classifications of functions is done
10 differently in the LMP framework.
11 MR. BROWN: Can I make an observation?
12 MR. TANEJA: Yeah.
13 MR. BROWN: We're talking about functions.
14 MR. TANEJA: Right.
15 MR. BROWN: But if I've got a reactor trip
16 system?
17 MR. TANEJA: Yeah.
18 MR. BROWN: It doesn't matter, functions,
19 or functions of detectors and what the channels, the
20 division, the processing, the data, the independence,
21 all that is the same. The only difference is what
22 kind of detectors and what's the substance of the
23 software packages that combines them into taking care
24 of this safety occurrence or this accident part, so it
25 doesn't depend on the safety analysis. Once the

1 functions are defined, you develop the functions --
2 (Simultaneous speaking.)
3 MR. BROWN: -- signals that you bring in.
4 MR. TANEJA: I totally agree with you.
5 See, what we are thinking about is, that the reactor
6 trip is presumed to be a safety-related function,
7 okay?
8 MR. BROWN: Uh-oh.
9 MR. TANEJA: No, no, no, no.
10 MR. BROWN: Of course it is.
11 MR. TANEJA: We got PDCs coming in from
12 some reactor vendors, they said they don't need to
13 trip their reactor, it's inherently safe. We don't
14 want to call it safety-related. So what do we do
15 about that? I think Joe has that similar experience
16 right now that we are going through.
17 MR. ASHCRAFT: Excuse me. Joe Ashcraft,
18 I&C. So, first of all, the first concern, we did add
19 a note, thanks to Charlie, that basically says you
20 could use the DRG for anything, including large light
21 waters. Now, it was developed for base reactors,
22 well, actually it was developed before that. But then
23 we had to fall under the LMP process.
24 But even now, we have applications, to
25 answer your question, they're not following the LMP,

1 but they want to follow the -- or use the DRG. So now
2 we got to get that overall defensive strategy or
3 whatever that plants are working on that still would
4 allow us to determine what we need to look at.
5 But I guess I agree with all the comments,
6 but I think we're pretty flexible to go however the
7 wind blows us as far using the DRG. Assuming that
8 they get all the right criteria in place up front. We
9 can't, you know, they can't say we're going to use the
10 DRG and gives us nothing, so to speak, so.
11 MR. BROWN: Well, the first DRG was the
12 DSRS, design-specific review spec, and it was -- who
13 wasn't --
14 MR. TANEJA: It was a light water.
15 (Simultaneous speaking.)
16 MR. ASHCRAFT: But that was the Commission
17 direction that said every SMR had to have its own
18 DSRS. So we created that, but then we sort of started
19 looking ahead for advanced reactors, and that's why we
20 went with the DRG. But we followed, along with the
21 principles, your concept of top-down approach. So
22 that shows up in the DRG probably ever more so than in
23 the DSRS.
24 So, we're moving forward in all our review
25 guidance. And going back to the Kairos thing, I mean,

1 all of these different SRP, DSRS, DRG, those are
2 things that we can use. That's in our pocket to use
3 for any kind of review as we see fit, more or less.
4 MR. BROWN: But I want to springboard off
5 of Dinesh's comment about -- haven't forgotten what it
6 was. Oh, no, it was your, it was the comment about
7 the plant's -- the new plant is safe, it doesn't need
8 any safety-related stuff.
9 So, step back for just a minute. You'll
10 really going to publicly advocate and advertise that
11 a reactor doesn't have to shut down? If it doesn't
12 shut down, it's just fine, it can just sit there
13 perking along, no matter how safe it is. It's really
14 a slick piece of publicity or public information.
15 You're going to get more throwback, and
16 it'll be another China Syndrome approach that we've
17 been living with since 1979. That just doesn't make
18 any sense. You just poke people in the eye when they
19 tell you that.
20 I'm sorry for my language, but I'm serious
21 from the standpoint not shutting down the plant does
22 not make sense under any circumstance. Automatically.
23 MR. ASHCRAFT: Well, no, so we are
24 reviewing at PDC topical on an application. But that
25 is their thought process. And one of my criteria, I

1 need to see the safety analysis and the safety
2 classification and all that up front before I can say
3 this is good.
4 But they're saying that they're going to
5 have shutdown rods, etc., but they're saying they
6 don't need to use them to protect their safety
7 methods, due to the inherent nature of their salt fuel
8 or whatever. So we're seeing it.
9 And Oklo was sort of in the same line of
10 not really needing a safety-related protection system.
11 So it's here, Charlie. I mean, we're looking at it.
12 MR. BROWN: I'm just saying, you are the
13 regulator and purveyor of safety for nuclear power
14 plants, regardless of what they look like, regardless
15 of what they look. And to have, and again, this is my
16 opinion, okay, to advertise or have it come out that
17 we don't have a safety system that shuts it down, even
18 though, you know, for whatever the -- even though it
19 doesn't have it, it makes sense from a overall public
20 safety perspective.
21 It just doesn't make any sense to let
22 something perc away until somebody runs in from their
23 house and turns the shutdown switch.
24 MR. ASHCRAFT: Well, I'll just say this,
25 this is the hard road they're going down. I mean,

it's not --

MR. BROWN: I understand that. I'm just -- I just think the NRC is going to have to -- they're going to have to establish some process before they get through this. Because the public -- you don't want to get into a bad public perception again. And we've survived, what, 21 plus -- 45 years of good operations.

CHAIR ROBERTS: Okay, Dave Petti has his hand up.

MEMBER PETTI: Yeah, I just want to say sort of on behalf of advanced reactor folks, I agree with the need for shutdown. I think for some of these systems, though, the time and how quickly you need to shut down could be quite different, just because of the inherent neutron characteristics of these different materials and coolants.

So I could see arguments being made in that vein. You might see some of that. I still think you need a shutdown system, if nothing else for defense-in-depth. But you might get different characteristics in terms of how quickly the rods have to go in. But that's, you know, that's really in the weeds of what the design looks like, etc.

MR. BROWN: I don't -- I would agree that

1 it doesn't have to be in 10 microseconds, or 10 -- 1
2 second or 30 seconds. But two and a half minutes?
3 Pretty simple system, and it can be redundant, and
4 you've got the plant shut down.
5 So I agree with you, Dave, from that
6 standpoint.
7 MEMBER PETTI: Yeah, yeah, sorry.
8 CHAIR ROBERTS: I think looking at this
9 slide and the discussion we just had, and also the
10 discussion we just had and also the discussion we had
11 this morning about hardware common-cause failures, it
12 seems like the key is the defense-in-depth model as it
13 applies to that particular technology or that
14 particular plant.
15 If you can put together a defense-in-depth
16 model that, let's say just in theory, didn't really on
17 automatic scram, then you could truly show that this
18 is the equivalent or better than many previous plant
19 in terms of its application of defense-in-depth. And
20 I'm not sure that would be a selling argument, but at
21 least it's a plausible argument.
22 But we kind of got to some degree in the
23 BTP discussion back in March, and I think that's part
24 of what you'll be sending us back in terms of comment.
25 But it seems like you progress in time

1 from 30-plus years ago, and the 93-087 SECY and the
2 NUREG-6303 and the four echelons of defense, and you
3 go forward in time, that had a fundamental plant model
4 behind it and a fundamental I&C integration model
5 behind it.
6 And all that's changed in 30 years. And
7 it just seems like there's value in re-baselining a
8 what is the echelon of defense, what is the defense-
9 in-depth model for this particular plant, as it
10 applies to the I&C system, and then go from there.
11 So again, that's -- we've already had that
12 discussion a couple months that's something I think
13 links to this whole question of it could be LMP, it
14 could be some other approach. But as long as there's
15 a technically justifiable defense-in-depth model,
16 you're going to see it again at the same place in what
17 the requirements on the I&C system are.
18 Does that make sense?
19 MEMBER PETTI: Yeah, I agree with you,
20 Tom.
21 MR. TANEJA: The only other thing I was
22 going to add to that was that the LMP framework also,
23 part of that requirement is to establish the adequacy
24 of defense-in-depth. So that also drives if there is
25 an I&C systems relied upon, you know, to do defense-

in-depth functions. So that adequacy of diversity in defense-in-depth is part of the LMP framework.

To add to another thing, you know, you said the DRG can be, is technology-inclusive and can be used for not just for non-light water reactor. So we have an applicant right now, BWRX-300, small modular reactor.

That design is a shoot-off of the ESBWR design. But they are proposing to use, we have a Topical Report in house, proposing to the IAEA type of defensive line of five -- four plus one defensive line approach.

So in that, they are saying hey, the I&C design that we want to present to you will follow the DRG framework because it works very well with our approach. So let's see what that application looks like. We haven't seen the -- you know, but we've just seen the Topical Report on their safety strategy, which is essentially laying out this defensive lines approach.

MR. BROWN: That's a BWR?

MR. TANEJA: BWRX-300. It's basically a scaled-down version of the ESBW that we certified, right.

Right, and you know, so we are going to be

1 using the DRG for that review. It's a light water
2 reactor SMR, you know, so. Next slide, please.
3 So we're on slide 37. So this is what we
4 have in-house right now. We've received the
5 Construction Permit application for Kemmerer, which
6 has been I guess found acceptable, and it's docketed
7 for review.
8 Natrium is a TerraPower and GE-Hitachi
9 technology. And when we looked at their application,
10 they're, even though they're following the LMP
11 framework, but that defensive line approach that we
12 are seeing in BWRX-300 is very similar to what they
13 are presenting, you know, how they are approaching
14 their defensive strategy, looking at these different
15 defensive lines.
16 So in Natrium right now, I think defensive
17 line 3 is a safety-related I&C system. And defensive
18 line 2 is their control system that basically has
19 protective actions which are precursor to, you know,
20 you reaching actually these setpoints for the
21 defensive line 3 activations.
22 So the way I think they're approaching
23 their design is that their thinking is that they would
24 probably never challenge their safety systems. Their
25 control system is so reliably designed that it will

1 keep the plant within its bound and never challenging
2 safety system. But it's there, in any case if it's
3 there.
4 So, so far it looks good. We have a
5 Topical Report also, you know, in-house. But the CP
6 Application, the Construction Permit Application of
7 Part 50, it incorporates by reference that I&C Topical
8 Report. But it's being reviewed as an independent
9 document right now, even though I think the timing is
10 going to be coordinated between CP and the Topical
11 Report review.
12 And --
13 CHAIR ROBERTS: Yeah, we actually had a
14 discussion on that scheduling last week, and the
15 question, it's really more of a TR and CPA
16 integration, the question is.
17 MR. TANEJA: Right.
18 CHAIR ROBERTS: There's a lot of Chapter
19 7.6 wrapper around this Topical Report. Just I'm
20 curious what your perspective is of how independently
21 you could review the Topical Report without having to
22 also look at the context in the rest of that chapter.
23 MR. TANEJA: Well, you know, the thing is
24 our Safety Evaluation has to be agnostic of that.
25 Even though we are kind of looking at both of them

1 same time. But when we write our Safety Evaluation,
2 it really needs to be focused on what's on that
3 Topical Report, right.
4 So right now what we are seeing in the
5 Topical Report, there's a lot of preliminary
6 information. They say it will be addressed later by
7 the user of that topical. And we expect to also have
8 some limitation and conditions on this.
9 So basically I think our, you know, going
10 forward position is going to be is that whoever
11 references Topical Report, like in this case Kemmerer
12 CP MOL application, they are doing that. They would
13 have to address all these preliminary information and
14 our limitation and conditions in these CP and OL
15 applications.
16 CHAIR ROBERTS: Yeah, that makes sense.
17 You'll have the benefit of saying how they actually
18 apply it to the topical. Then you have to back off
19 and say okay, it doesn't have to be applied this way.
20 In a way, it gives you a little bit more work, but I
21 guess it gives the applicant more flexibility for a
22 future application.
23 MR. TANEJA: Like I said, it's the
24 applicant's choice. They choose to give us a topical.
25 They could have put the information in the

application. I don't know why they chose this path.

And so mostly, you know, the X-Energy application is not in-house yet, but we are doing the readiness assessment. So when we were doing the readiness assessment, their CP application, at least what we saw in the draft, has the I&C architecture and everything within the application.

It was not very ready yet when we -- so our feedback to them was we looked at your white paper on I&C, that looked very good. And so are you planning to submit a topical or a technical report? They said no, no, no, we are going to incorporate that stuff in the Operating License application.

So I don't know what the -- when they submit the X-Energy what it's going to look like, but you know. But that was our interaction with them during the pre-application engagement.

CHAIR ROBERTS: Okay, thanks. Part of the staff's flexibility.

MR. TANEJA: Yeah. I mean, it's really, you know, it's how the applicants are trying to frame their submittals, right.

So next slide, slide 38, I think. Yeah. So the other activity that we have right now under is Kairos Hermes 2 Construction Permit Application. I

1 believe there's already some ACRS interactions taken
2 place on that application. And you know, if anybody
3 has any more questions on that, Joe is here. He's a
4 reviewer of that, so he has everything he knows about
5 it.
6 So we expect the final Safety Evaluation
7 to be issued by November 2024. So that's where we are
8 on that one.
9 The, like I spoke about, the X-Energy XE-
10 100, it's Long Mott CP Application. We are currently
11 in the pre-application engagement with them. And we
12 expect the CP Application to be in by the end of the
13 November/December timeframe is what I'm hearing right
14 now, nothing formal. So next slide, please.
15 So the new light water reactor work that
16 we are doing. So we are very deeply into the NuScale
17 Standard Design Approval Application. From the I&C
18 perspective, the -- for the US460 design, the I&C
19 architecture is essentially the same as what we
20 certified in the previous design.
21 They are still using the HIPS Platform and
22 it's still exactly the same architecture. There are
23 different FPGAs and different divisions to have built-
24 in diversity in the--. So the only deltas that we
25 have really seen between the two designs from the I&C

1 perspective is that they made some changes to some
2 signals for safety activation.
3 I think there was a signal they used to
4 rely on containment level, now they rely on RPV,
5 reactor pressure vessel level, to initiate that ECCS
6 actuation, I believe it is.
7 And so because they did that, they had to
8 change the type of level sensor they were using. So
9 this level sensor is, you know, off a different
10 technology, but it is a proven technology. It's the
11 unique application that they're doing.
12 So those are the deltas that I see between
13 what we have already certified to what we are seeing
14 here. You know, their ECCS valves, I believe the
15 reactor vent no longer has the inverted block valve in
16 it. They took that out.
17 So that's something that's something
18 that's being evaluated, you know, to see how the non-
19 safety power is going to make sure that the valves
20 don't preemptively open, you know, due to loss of that
21 DC power. But that's a -- that's a work in progress.
22 And I think right now we are scheduled to
23 come in front of you with the I&C review. Our SC is
24 done. It's right now with OGC I think. You know,
25 they are looking at it. And we are scheduled to

1 present that to the ACRS I believe in August of this
2 year.
3 Clinch River application. That is a
4 application of the BWRX-300. Now we are -- we have
5 had pre-application engagement. I think what we heard
6 initially from that was that they intend to meet all
7 the GDCs.
8 I believe I just saw some email that I
9 haven't had a chance to, but they have posted
10 something in the reading room to say that they're
11 changing some of the GDCs to PDCs. That may be due to
12 the safety strategy Topical Report discussion that
13 we've been having with them. So that's happening.
14 Because this is also a design that is
15 being, you know, we have a cooperation of review with
16 the Canadian regulators and now UK regulators also
17 coming into this. So it's like we are also exchanging
18 our notes with these regulators on what we are
19 finding.
20 So that application is also expected by
21 the end of the year. So you know, we're seeing more
22 work coming out in the new and non-light water reactor
23 area than these upgrades to the existing reactors
24 right now, but that's the work load that we have.
25 Next slide please.

1 Joe, you have something to add?
2 MR. ASHCRAFT: Yeah, Joe Ashcraft. So of
3 the three slides that he showed you and one on Kairos,
4 so all of the things he discussed on power reactors
5 except Kairos. And it's, even though Hermes 2 --
6 CHAIR ROBERTS: We can't hear you.
7 MR. ASHCRAFT: Pardon. Can you hear me
8 now?
9 CHAIR ROBERTS: Just barely.
10 MR. ASHCRAFT: So this is Joe Ashcraft,
11 I&C. So the last three slides that Dinesh presented,
12 they were all power reactors except for the Kairos.
13 And Hermes 2, although it produces power, it still
14 meets the threshold of being a test reactor. And what
15 I see is missing is the Abilene Christian University
16 --
17 MR. DARBALI: No, no, no, it's coming.
18 MR. ASHCRAFT: Sorry, I guess I jumped in
19 too soon. All right.
20 MR. TANEJA: Actually, we are ready to go
21 to the next slide. Joe, do you want to talk about it.
22 More than welcome.
23 So I'm staying with the power reactors.
24 So next slide, please. Next, okay, slide 40, I'm on
25 slide 40.

1 So Holtec SMR-300. We're in pre-
2 application engagement with Holtec on that one. And
3 right now we are hearing that they're going to be
4 submitting an I&C design technical report or Topical
5 Report. Not sure what it's going to be. And that's
6 expected by end of 2025. And then the construction
7 permit application by June of 2026. And that's really
8 what we are hearing from Holtec on that one.
9 So this is also a PWR-type small modular
10 reactor design that they have, so. Next slide.
11 So now, Joe, this is the research and test
12 reactor and fuel cycle facilities. I know you
13 completed Kairos Hermes 1. Construction permit has
14 been issued.
15 SHINE Operating License Application, I put
16 down in progress. I really don't know where we are.
17 I, you know, we were very much into it up until about
18 a year and a half ago or so. And they have the --
19 they were using the HIPS Platform.
20 And we even went and witnessed the -- it
21 was the initial -- not the requirement. I think there
22 was a requirement phase of their life cycle
23 activities. They were all built, sitting on the floor
24 being tested.
25 And then we were supposed to go back and

1 look at the subsequent phase of that test. And then
2 all of a sudden they ran out of money, they stopped
3 the project. So but we still have that active
4 application. I don't know what's the holdup on that
5 one. That's a medical isotope facility.
6 MR. BROWN: So in progress is your status,
7 not SHINE's status?
8 MR. TANEJA: SHINE is --
9 MR. BROWN: They stopped, didn't -- I
10 mean, they --
11 MR. TANEJA: Well, what I heard is from
12 the PM, I was talking to him. What I heard is that
13 SHINE is trying to redesign some of their buildings
14 could take it from Seismic Category 1 to 2 to try to
15 save some money on some of these areas.
16 MR. BROWN: It's not quite, it's not
17 totally quiet then.
18 MR. TANEJA: Well, it's just they are not
19 spending -- they have a little bit of money. So
20 they're spending a little bit of money to do some of
21 these reengineering work right now.
22 MR. BROWN: Okay.
23 MR. TANEJA: So I don't know what that
24 means. That means that we're going to open our Safety
25 Evaluation again and re-look at some of these things.

1 I don't know, you know, where we are this point. But
2 there is something, it's still on our books. It is a
3 active project. They haven't withdrawn the
4 application.
5 Kairos Hermes 1, they have the
6 Construction Permit and Operating License Application
7 we are expecting by the end of the year on that one.
8 And ACU, that review is in progress right now. And
9 that's a, you know, we've already completed our Safety
10 Evaluation for the I&C section, and that's with the PM
11 right now.
12 And that's an 18-month review, you know,
13 with the application review due I think September
14 2024. Is that correct? I know that's the status that
15 I got. I think Joe is going to add to it.
16 MR. ASHCRAFT: Yeah, I'm not sure about
17 the date, but actually the SE, we started to get
18 comments from OGC, so it's further along. I mean, up
19 until like yesterday, I thought it was just with the
20 PMs, but it has been to OGC and they filtered some
21 comments back. Nothing too major, but we're resolving
22 that now.
23 CHAIR ROBERTS: Are there any interesting
24 limitations and conditions or other issues with the
25 SE?

1 MR. TANEJA: The look on Joe's face.

2 MR. ASHCRAFT: Well, when you say

3 limitations and conditions, so what we've got is the

4 information sufficient to issue a Construction Permit.

5 You know, they haven't established their I&C platform.

6 They haven't provided us a lot of information.

7 But based on what we've looked at, and

8 similar to Kairos, we feel that they provide enough

9 information that they can build it and meet their

10 regulatory requirements.

11 One difference between Kairos and ACU,

12 Kairos was using the NUREG-1537 and ACU is using the

13 ORNL version of NUREG-1537. And I think Norbert was

14 talking earlier about doing different volumes of that

15 NUREG-1537.

16 So, a little bit different. I&C for the

17 most part is the same. What's still not real clear is

18 what's really needed for a Construction Permit. It's

19 not really called out. Just like the SRP doesn't

20 really call out. So that's where we're at on those.

21 CHAIR ROBERTS: Okay, thanks. There's

22 really not enough detail to know if there's an issue

23 or not, what it sounds like.

24 MR. BROWN: Are you finished with this

25 slide? I have a question on this slide.

1 MR. DARBALI: Yeah, just the only thing I
2 had to add was that, you know, we are also supporting
3 our colleagues over at NMSS with the fuel cycle
4 facility for X-Energy. That's in progress.
5 MR. BROWN: Hermes 1 application is in the
6 fourth quarter. Hermes 2, got information on it and
7 the I&C layout was different than it was Hermes 1,
8 which we think we passed that information back
9 somewhere along the line.
10 Is somebody -- I mean, it's different.
11 They rearranged their plant PCS stuff, what it feeds.
12 One controller, two supervisors, no supervisors, non-
13 redundant bus, blah, blah, blah, and that was
14 different from Hermes 1. So here you've got Hermes 1
15 is -- have they backtracked and now doing Hermes 1 the
16 way they're doing Hermes 2?
17 MR. ASHCRAFT: So the areas that you are
18 talking about in that architecture is really in the
19 non-safety area. And although I agree there are
20 differences, and I believe in the Hermes meeting you
21 asked about the redundant --
22 MR. BROWN: It was Hermes 2 meeting.
23 MR. ASHCRAFT: No, no, no, in the Hermes
24 1, you asked them, A, what platform, and B, about that
25 redundant --

1 MR. BROWN: It had a redundant bus or
2 something like that.
3 MR. ASHCRAFT: Well, they said they did,
4 but it wasn't really in the application. So, when the
5 OL comes, because they're still designing.
6 And I think from that feedback, and even
7 in Hermes 2, although it doesn't show up on the
8 architecture drawing like you would like to see, or at
9 least it's not clear, because they really don't have
10 a legend that describes those thin black lines. But
11 they do later on talk about main control rooms to the
12 PCS as being redundant. But that --
13 MR. BROWN: In Hermes 1 or 2?
14 MR. ASHCRAFT: Well, I'm talking Hermes 2.
15 MR. BROWN: Yeah.
16 MR. ASHCRAFT: But generally speaking,
17 they both are going to have redundant lines from the
18 main control room to the PCS, although it's coming in
19 the OL. So you know, to be seen.
20 Now, as far as that supervisory control
21 thing, in the Hermes 2, they talked about they're
22 using switches and gateways.
23 MR. BROWN: So the switch from two
24 switches to one --
25 MR. ASHCRAFT: Right.

1 MR. BROWN: One controller or something
2 like that.
3 MR. ASHCRAFT: But once again, they're in
4 the design stage and you know, even though you saw the
5 difference, and thank you for highlighting it --
6 MR. BROWN: That's the trouble with
7 reading these things, right?
8 MR. ASHCRAFT: Exactly. And I know you're
9 going to bring up the one-way diode. I just know you
10 are, Charlie.
11 MR. BROWN: Gee whiz.
12 MR. ASHCRAFT: So that's been discussed
13 with them over and over again, and I expect to see it.
14 But once again, as I was telling you earlier, this is
15 NUREG-1537, so it's a little bit different than what
16 we would expect and want and demand in a power
17 reactor. But I'm working on it, and I think we'll see
18 it in the OL.
19 MR. BROWN: It's a reactor.
20 MR. ASHCRAFT: I can't argue that fact.
21 MR. BROWN: Tens of megawatts, right.
22 MR. ASHCRAFT: I'm going to go back to my
23 seat, unless there's something more.
24 MR. BROWN: It's just all this stuff is
25 being thrown out and there's no certainty to anything

1 right now.

2 MR. ASHCRAFT: Well --

3 MR. BROWN: That's what it seems to me.

4 We're reviewing and saying yeah, it's okay to go, but

5 we don't really know what it looks like.

6 MR. ASHCRAFT: Well, so when you --

7 MR. BROWN: Except for promises coming in

8 the future.

9 MR. ASHCRAFT: Well --

10 MR. BROWN: Because that's my opinion,

11 since I'm not a member here.

12 MR. ASHCRAFT: Okay, and I'll let Dinesh

13 speak to this. But in that ISG, he had in Appendix A,

14 he kind of talked about what's needed in a

15 construction permit. And one of the big ones is

16 architecture. We look to see, we want to see safety

17 limits and we'd like to see what processes you plan on

18 using to protect those PDCs.

19 If you have a topical, yes, that's great.

20 So it's not a full-blown review. And I -- when we get

21 the OL, then we're going to be back to, you know, why

22 didn't you look at this and talk about that.

23 But at this point, we're really -- we're

24 providing a shell of a design that could meet the

25 regulatory requirements, you know. And we feel

1 confident that they should be able to. But we won't
2 know for sure until we get that OL and we look at
3 their platform. I mean, a lot of it's going to be
4 part of the platform reviews, whichever platform they
5 use.
6 MR. BROWN: Well, they also shifted the
7 electrical power out of the PCS group into another box
8 over on this slide.
9 MR. ASHCRAFT: Well, so --
10 MR. BROWN: There's a couple of -- all I'm
11 saying is there's a bunch of differences between the
12 Hermes 1 and Hermes 2, so --
13 MR. ASHCRAFT: The big difference, and
14 I'll just go quickly, I'll go quickly --
15 MR. BROWN: Oh, no, no, you can stop. I
16 said enough.
17 MR. ASHCRAFT: All right.
18 MR. BROWN: We need to get on with it. I
19 just wanted to make sure that the differences were --
20 (Simultaneous speaking.)
21 MR. BROWN: -- in this such that we will
22 bring them up later so they don't get lost.
23 MR. ASHCRAFT: The new systems that they
24 added was to produce that power that Hermes. That but
25 -- for generally speaking.

1 MR. BROWN: Yes.

2 CHAIR ROBERTS: I think it's fair to say
3 some of this stuff within the scope of what was
4 provided in the CP, that any changes are almost, I
5 won't say cartoonish, but they're very notional in
6 terms of these are the kinds of boxes that might exist
7 in either Hermes 1 or Hermes 2.

8 But there really isn't the detail there to
9 see what was in the system. So kind of the guidance
10 I've gotten is you really can't over-read what's in
11 those diagrams because it's just -- it's a shell of
12 what might be provided.

13 So I think I agree with Joe that the key
14 is to wait and see what comes with the OL and then I
15 think we already asked the questions.

16 MR. BROWN: I would have -- I agree with
17 that, except between one and the other one, the words
18 "redundant" disappeared, single lines replaced one
19 line. Things like -- it's just, it's a thought
20 process, what are they thinking. Because they made
21 conscious changes to it when they didn't need to when
22 they went from 1 to 2.

23 CHAIR ROBERTS: Yep, and so by fourth
24 quarter this year we'll all be able to answer those
25 questions.

1 MR. BROWN: All right.

2 CHAIR ROBERTS: Okay, thanks. I'm just
3 curious, the scope of the help you give to NMSS for
4 the Fuel Cycle Facility, is that something that you
5 have the expertise so they come to you? It doesn't
6 seem that really fits into the rest of the list.

7 MR. DARBALI: For the RNC review. The
8 Fuel Cycle Facility RNC reviews are typically done by
9 us because I don't think they have any expertise over
10 at the NMSS. So we usually do those reviews, you
11 know. And we, when I think Dave, you know, he even
12 developed the review guidance for NMSS for that, you
13 know, so.

14 MR. TANEJA: Yeah, so what I was going to
15 say was that Part 50 review, we haven't done Part 50
16 review. I know we've done a lot of Part 52 lately,
17 where we were expecting essentially a complete design.
18 So we were able to get a lot of details that part --
19 Part 52 application review, because we were going to
20 certify that design. So we needed more substantial
21 certifiable information.

22 As a construction permit application,
23 their Part 50 is looking for essential information
24 that is needed to have essential assurance that the
25 plant can be safely built.

1 So I think from the RNC perspective, what
2 we've been asking is give us the architecture, give us
3 what safety functions you expect RNC system to
4 perform, tell us what regulatory criteria you are
5 intending to comply to, and what codes and standards
6 that you think your design is going to meet.
7 So it's limited set of information to
8 really have enough confidence that it can built
9 safely. But they don't get the Operating License 'til
10 actually the plant is built and running. So we get
11 our hands on the review of the actual as-built plan
12 before they get the Operating License. That's the
13 difference between Part 50 and Part 52.
14 Part 52, they get a license just on paper
15 exercise. And now we'll build it. You know, so we
16 saw what happened with Vogtle. We had a bunch of
17 amendments. Because they got a license, now they're
18 building it. Now you have to build it, just like your
19 license to build, right.
20 Here, in Part 50, I think we're going to
21 expect as it's progressing we're going to be basically
22 looking at those things. And they actually don't
23 receive an Operating License 'til the as-built plan.
24 But I think from the I&C perspective, we expect to be
25 very involved in our review 'til the last minute, 'til

1 the site acceptance testing.

2 That's what I would expect to be, you

3 know. We will be involved in that 'til they get the

4 Operating License. So I think that's the difference

5 between Part 50 and Part 52.

6 More to come in these reviews, you know.

7 And I think they chose to go this route because they

8 want to start building. It's in the news, Kemmerer

9 has already broken ground, and I think I saw yesterday

10 Bechtel was advertising that we're going to have so

11 many people hired and xyz, and they're going to be

12 doing all this, you know, construction in Wyoming. So

13 I guess, you know, under Part 50, they can start doing

14 a lot of that work, so.

15 All right, next slide. All right, so

16 these are the Topical Reports that I think I've

17 already talked about some of these. But basically, we

18 have the Natrium I&C architecture and design basis

19 Topical Report. So we've already basically prepared

20 and submitted the audit plan. And we are in the audit

21 phase.

22 So it's like it's in review state. And

23 I'm sure, you know, if you guys are interested, we

24 will probably will come and present our findings on

25 that, you know, topical.

1 The BWRX-300 safety strategy Topical
2 Report. There is nexus to the I&C discussion quite a
3 bit in there. So we are not leading that Topical
4 Report review, but we are supporting that review.
5 Like I said, you know, there is some details of
6 safety-related I&C in defensive level 3.
7 And then they are saying that the
8 defensive level 2 control system, which is divorced
9 and independent, is going to be like a EMR
10 architecture, highly reliable. You know, those are
11 the words that we are hearing.
12 And then defensive level 4 is going to
13 have I don't know yet exactly, but it's going to be
14 divorced from level 3. So if level 3 functions are
15 unable to perform their safety function, your defense-
16 in-depth basically is going to be level 4, you know,
17 functions.
18 So that's the safety strategy, what it
19 looks like right now. It's under review. We are in
20 the audit plan preparation stage on that one. So I
21 think, you know, my quick read of that is essentially
22 that, so let's see how that progresses, you know.
23 We are looking at the multi-currency
24 (phonetic) platform Topical Report. It's a revision
25 to the topical that we've already approved. And it's

1 really in support of the Holtec SMR-300 design. So
2 that's really where I think they intend to work with
3 Mitsubishi for the I&C design for the Holtec SMR-300.
4 ALS 2 Topical Report. Was there a
5 separate slide on that one? Next slide I think. I
6 thought that we were going to take it out for a year.
7 Next slide, please, 42. Yeah, 43. Yeah. I thought
8 it was we had to go to a separate slide.
9 So the eVinci Microreactor. I think
10 Westinghouse has submitted a revision to the ALS, you
11 know, Topical Report. So they're calling it ALSv2
12 design. So we've completed the Safety Evaluation on
13 the Topical Report on the development process and on
14 the ALSv2 technology.
15 And there is a third Topical Report on
16 surveillance requirement and functional test
17 elimination. That's under review right now. So that
18 is in the works.
19 I don't know where we are on the actual
20 micro-reactor. I think Westinghouse has plans to
21 build that in Idaho, and then we'll go from there.
22 But right now we have the topical that we've been
23 working on. I think that's all the topicals. Next
24 slide, please.
25 Yeah, stakeholder engagements. So, for

1 the advanced non-light water reactor, we've got -- we
2 have been meeting with the stakeholders for some time
3 now. And I think we had our third workshop with them
4 right after the RIC this year in March.
5 And so we created this public, on the NRC
6 public website, this web page where we are documenting
7 all the meeting summaries of the workshop that we've
8 had with them.
9 But in this last workshop in March, I
10 think we had made a commitment to the Commission that
11 for the non-light water reactor, the requirements that
12 they laid out in the SRM-SECY-22-0076, we are going
13 to, you know, our LMP framework in the DRG is
14 inherently risk-informed. And it has the -- it meets
15 the intent of a SECY.
16 So we want to let the users or let the
17 stakeholders know that they have to address this
18 Commission policy in their applications. And we see
19 that in both of the applications that we have seen
20 from X-Energy and from -- for the Kemmerer
21 application, that they are addressing the SRM in their
22 application, how they are addressing their
23 requirements.
24 So we basically advertise that to the
25 stakeholders during the workshop that they need to be

1 cognizant of that. And as far as updating our
2 guidance documents, really we wanted to, you know,
3 work through the DRG and the LMP framework to see
4 exactly how to benefit, you know, how to efficiently
5 update those documents.
6 So that's really what we committed to, and
7 I think that's where we are on that one.
8 I think we are continuing to have these
9 workshops with them. I think there's already
10 discussions happening about our next workshop, the
11 topics of are the current standards risk-informed.
12 Like, they pointed out one of the IEE standards for
13 post-accident monitoring, and some of the elements of
14 that really are not carrying over very well with their
15 non-light water reactor designs.
16 So they're also working with the SDOs on
17 that one as well. So I think we're going to probably
18 meet in our next workshop to address and bring up what
19 are these different issues that they're finding. So
20 I know that they are telling us that they're going to
21 use the 603-2018 version, which that's what they're
22 working on.
23 And we are kind of working on that in
24 parallel with, you know, doing the rulemaking, so. So
25 I don't know what other standards that they're finding

gaps, so we'll hear from them.

The other pre-application engagement, like I said, you know, the readiness assessment of the Long Mott application. We have been doing readiness assessment of the Clinch River construction permit application. And meeting with Holtec SMR-300 for the I&C design. And I know that they have also been meeting with other technical areas as well.

So that's for the stakeholders' engagements. Next slide, please. So that really takes care of our efforts right now in the advanced reactor, whether it's light water or non-light water work that we are doing at this stage.

MR. ROGGENBRODT: Thank you, Dinesh. So, now we'll go over the activities in the areas of --

CHAIR ROBERTS: If I could get a sense in the room? We've been going for about an hour and a quarter since we restarted. Keep going because I wish to keep going or take a break now? In the room? Okay, let's keep going, okay.

MR. DARBALI: So, now we will go -- this is Samir. We'll now go over the research activities in the areas of I&C guidance, modernization and new technologies for nuclear I&C applications. And I want to recognize the research I&C staff that is in the

1 back of the room who have supported this effort and
2 who I will be turning too in case there are questions.
3 So, here on slide 46, the staff in the
4 Office of Research is working on various research
5 efforts initiated by NRR research assistance requests
6 in the area of I&C guidance modernization to support
7 the use of performance-based design methodologies and
8 approaches that reduce time, cost, and uncertainty.
9 The purpose of these research activities
10 is to enable staff's ability to evaluate performance-
11 based submittals, for example, on the use of technical
12 approaches for which the staff currently does not have
13 adequate guidance. The outcome of these activities is
14 to inform review efforts and applications that
15 reference these methods.
16 The first of these research activities
17 focused on hazards analyses, including systems
18 theoretic process analysis or STPA, which is part of
19 the approach that is being proposed in NEI 20-07.
20 STPA is also part of the EPRI design and hearing guide
21 which is being rolled out in the industry. This
22 particular effort is nearing completion.
23 The second research activity focuses on
24 model-based systems engineering which is used to
25 identify and address design and development issues

early in the development process, thus reducing the assurance time, cost, and uncertainty. This effort is in the late stage of the contract solicitation.

The third research activity focuses on a safety assurance case which enables organizing different kinds of evidence and their logical integration to demonstrate safety. This particular research activity is currently being executed.

And the fourth research activity focuses on utilizing the systems engineering approach in performance-based evaluation of the safety system with systematic consideration of its interactions with its environment, for example, its interactions with the control room.

The first three research activities enable the systems engineering approach, and this effort will complement EPRI's systems engineering based guidance for developers.

MR. BROWN: Am I to presume since RAR is what, research --

MR. DARBALI: Assistance requests.

MR. BROWN: Assistance requests. I guess I -- basically we're now making changes to support a performance-based approach to I&C designs. Does that mean all of our previous systems were non-performance

1 based?

2 MR. DARBALI: Well --

3 MR. BROWN: I'm being a little bit cynical

4 here because, based on 35 years of developing systems,

5 I can't ever remember an I&C system that wasn't

6 performance based.

7 MR. DARBALI: Right, it's --

8 MR. BROWN: When you turn a switch, a pump

9 should start, a bag --

10 MR. DARBALI: Right.

11 MR. BROWN: -- should open, the rods

12 should scram, the system pressure changes, the

13 indication should go up or down.

14 MR. DARBALI: Right.

15 MR. BROWN: I'm trying to figure out what

16 the difference is between what we had before and what

17 we -- I never objected to the words because they don't

18 change anything.

19 MR. DARBALI: Right, some of our guidance

20 has historically been more prescriptive than --

21 MR. BROWN: It's still performance based.

22 MR. DARBALI: Yes, it tells you what to do

23 and what the goal is. I think the push for more

24 performance based is focused more on what the goal is

25 rather how to do it.

1 MR. BROWN: I just wanted to -- that
2 doesn't make too much sense, but I will --
3 CHAIR ROBERTS: Believe it or not,
4 Charlie, I had a very similar question. When I look
5 at the way that term is used and what it's used
6 against, it seems like all of these four columns
7 represent different approaches at hazards analysis
8 where the idea is you take your actual system and go
9 figure out what's my concern? You know, how do I
10 break it and how do I avoid breaking it? Is that
11 right? Is that what this is?
12 So, that has to be performance based.
13 Instead of using somebody else's requirements they
14 wrote and put in a book 50 years ago, you have to
15 figure out for your plan how I could break it and then
16 orient the I&C requirements on how do I avoid that?
17 Is that fair?
18 MR. DARBALI: I could give my take on it,
19 but I'd rather somebody from research give a proper
20 response. Thank you.
21 DR. BIRLA: I'm Sushil Birla, Senior
22 Technical Advisory in the Office of Research
23 supporting NRR DEX on this project, these activities.
24 So, in essence what you are saying is right. This is
25 an approach to performance-based. What can go wrong?

1 What can create harm? Identify those factors and then
2 formulate the safety constraints so that they don't
3 occur.
4 In other words, drive the design, but as
5 our traditional analysis techniques like FME require
6 a design, you spent all of the money on the design and
7 then you're analyzing it. That's the major difference
8 here.
9 CHAIR ROBERTS: Okay, thanks. Go ahead,
10 Dennis.
11 DR. BLEY: Yeah, Sushil, I'm glad you're
12 here. I've listened to NEI talk about STPA and I've
13 played with it a little it. There's a tremendous
14 amount of overhead, in my opinion, in trying to do an
15 STPA analysis. There's also some kind of hidden
16 assumptions there. They're different ones than you
17 find in other approaches, but I hope we're not putting
18 too many eggs in that basket.
19 It just seems like it's way too much work
20 in many areas, and you can find, as long as you're
21 really familiar with the design of the system, you can
22 find easier ways to solve that problem. Do you have
23 any opinions on that?
24 DR. BIRLA: Okay, first let me give some
25 evidence. Your observation was that the two are into

a familiar design. Why should they go through all of that overhead? Well, that was the experience in Limerick. They chose a design path that they were very familiar with, and then the lessons learned reports, there are two volumes to it, they wrote look, by using STPA, we didn't really add a whole lot of value.

So, if you're already familiar with the design, you have experienced people, you can draw on that experience, but when you don't have a familiar design, everything is new, then you need a systematized approach. There is no experience in the staff to lean upon. That's where they see an opportunity here.

Also, recognize that with software-dependent, interconnected systems, a lot of the hazardous conditions in the design are from interactions. In other fields of application, they have shown, they meaning researchers, particularly the MIT folks who developed the technique, that interaction-related hazardous conditions are easier to discover through STPA.

DR. BLEY: Yeah, the committee had, not Professor Leveson, but a couple of her key guys who developed their software and worked on the method,

1 come in and give us a talk, and I've read a lot of
2 their stuff. I find that having people who aren't
3 experts in the kind of systems we're building, that
4 overhead is probably necessary to get you to ask the
5 right questions.
6 Some of our more traditional systems
7 analysis techniques, I think, carry us very well with
8 a lot less overhead as long as we have the design.
9 Now we're coming up with new designs, but they aren't
10 new to the extent that all the pieces are new.
11 They're hooked together in different ways than we've
12 done before, and the techniques, I would -- anybody
13 who is going to analysis any system, including an I&C
14 system, has to really dig in and understand how the
15 individual components interact with each other and
16 where the dependencies lie.
17 So, I've heard the story. I'm not
18 convinced, and I'm really struck by the overhead
19 there. I don't know how much experience industry
20 folks have had applying it, but I bet it's not enough.
21 DR. BIRLA: Yeah, so for a successful
22 outcome of a hazard analysis, that means results that
23 are dependable, there are three factors. The
24 technique is only one of the three factors. The
25 quality of the design information you're working with

is the second factor, and the competence of the performer is the third factor.

And the competence in the performer, it's not just the competence in using the technique, but as you pointed out, Dennis, it is also knowledge of the systems. And it takes, according to one service provider to industry who has many decades of experience and also had direct experience with STPA, in this individual's experience, he said it would take about 15 to 20 years of engineering experience in the design of these systems to be able to come to the level that you need to come to, so your observation in that respect is also right. We cannot just count on the technique to do everything for you. You need the other two factors too.

DR. BLEY: Thank you. Your numbers two and three of this are, to me, crucial, and anybody who has people trying to analyze this system without those two elements being solid is asking for trouble no matter what techniques they use.

DR. BIRLA: Now, I don't want to let you know the industry side of the story, but about three or four years ago, EPRI conducted an experiment. So, through operating experience they knew certain conditions that had occurred in the plant, mostly not

1 affecting the safety, but still these were conditions
2 that were unexpected.
3 So, they took people from different plants
4 around the country and gave them the blind assignment,
5 without really telling them which incident it was, and
6 asked them to perform the analysis using STPA, and
7 after some limited amount of training, and they
8 observed, now this is them I'm quoting, that these
9 people were able to identify those conditions.
10 So, that encouraged EPRI to move in that
11 direction. They developed their design engineering
12 guide for industry using these concepts, the system
13 engineering concepts that STPA is one of the several
14 techniques of hazard analysis, but not exclusively,
15 and began rolling out their engineering guide.
16 So, industry is putting in resources.
17 Constellation put in quite a substantial amount of
18 money in training their people. So, and as this slide
19 says, it is part of NEI 20-07.
20 So, there's enough interest expressed from
21 the industry side that we as regulators have to be
22 ready, so this is why we invested our resources to see
23 what it takes. What you're saying is some of our
24 findings too.
25 DR. BLEY: Okay, I can understand where

1 you are and what you're doing. We had presentations
2 from EPRI and NEI too and I was not particularly
3 convinced, and I have 50 years' experience in doing
4 risk and reliability kinds of studies, and the folks
5 I've worked with, I think, can solve those problems
6 more efficiently, but not everybody has people with
7 the extensive experience you described.
8 So, it will be interesting to watch and
9 see how this progresses, see what things get left out.
10 I don't know if you've done it, but in reviewing that
11 process, identifying the places where there, at least
12 to me, seem to be some kind of hidden assumptions in
13 all this work, is probably pretty important to help
14 you decide where to look when you review such
15 analyses.
16 DR. BIRLA: That's right. That's right,
17 and even if we can consistently review an STPA-based
18 analysis, we need to understand under what limitations
19 and conditions could we do that. We know already that
20 totally open-ended, sorry, a totally open-ended design
21 would be beyond our scope. We've already had those
22 discussions with the NEI people and they acknowledge
23 that, but thanks for the discussion, Dennis.
24 DR. BLEY: Okay, yeah, thank you as well.
25 CHAIR ROBERTS: I think that was very

1 important insight and maybe we all intuitively
2 understand that if you don't have a plant design to
3 model and good people who have the 15 to 20 years'
4 experience that you just mentioned, that probably no
5 technique is going to work.
6 And maybe that's one of the, you know,
7 take-aways from this slide is that having a structure
8 is good because if you put a bunch of people in a room
9 and say go derive all the hazards in this plant,
10 you're probably going to not get as repeatable a
11 result as if there's some sort of, you know, process
12 that they can follow, whether that's STPA or anything
13 also in this chart, I guess part of what the research
14 project is doing.
15 I talked out the outset about the
16 strategic view and I'm just wondering if this is one
17 of them from the standpoint of when you're going to
18 more performance-based approaches vice following the
19 predefined performance bases that their, you know,
20 people follow, if it's kind of a case basis
21 performance-based that somebody might more agree with,
22 that you might want to be able to go that way.
23 With all of these new reactors coming down
24 and different technologies, to have a way to be able
25 to get through that to an extent that the applicants

1 can use it or you can understand it, is that a fair
2 statement of maybe a strategic vision that is
3 currently underway?
4 MR. PAIGE: Yeah, exactly. This is part
5 of our strategic long-term approach that we're trying
6 to implement with NRC, and this is Jason.
7 MR. BROWN: I look at the performance-
8 based thing also, aside from my earlier comments.
9 Performance-based to me really dictates how you try to
10 accomplish what you're actually, your end result you
11 desire to get out.
12 For instance, if you've got a very crude
13 system where slam one way, slam another way, real fine
14 tuning and high performance is not necessarily needed.
15 A very simple method of control or components to build
16 it and how you design it will give you that
17 performance and much less expensive than what you may
18 do if you wanted a more sophisticated system.
19 So, to me, that's what performance-based
20 means. If you've got a complex system because you've
21 got very fine tuning, very precise, you know, features
22 you have to accomplish, then you end up with one
23 result. If you don't have real fine-tuned, precise
24 end requirements, you can do it on a little bit more
25 hammers and nails type approach.

1 You don't have to build the steel
2 structure to be stable. Wood and nails might work
3 just fine depending on what you're going to use it
4 for. So, that's how I view performance-based, not
5 just kind of overall thought process.
6 The other words that I worry about, people
7 worry about is the technology-inclusive type thing,
8 because that can lead you to doing things that you
9 don't really want to do. I mean, when I first started
10 working, I was working with magnetic amplifier type
11 I&C equipment, and when I got back from my nuclear
12 engineering class at Venice, I was given a project
13 where it was no longer --
14 The same specification for the 25 and the
15 LGNs were used, the same one was for the new cruisers,
16 36 and 38 class, only now it was going to be a hybrid.
17 It was going to be mag amps and transistors. The
18 reason was transistors were very susceptible to
19 voltage transients back in the '60s, whereas mag amps
20 were very sturdy and they also provided noise
21 isolation.
22 So, the input circuits for all of our
23 primary plant instruments and everything else
24 maintained an input, but transistorized circuits. It
25 was technologically inclusive. The spec was exactly

1 the same. We just went out -- when we were going from
2 the Nimitz class I&C, a bunch of cabinets that were
3 all integrated circuits, the old 741s and 711s, the
4 operational amplifiers, we said well, we were asked to
5 deliver equipment.
6 We had no software, and this was 1980,
7 '79, '80, no software standards. Nothing was
8 available. So, we gave the vendors the spec, the same
9 spec we used for the operational amplifiers and said
10 build it out of microprocessors. The resulting
11 outputs were exactly the same.
12 So, the basic performance requirements, if
13 it was accuracy, time response, et cetera, et cetera,
14 the performance. So, the point being is
15 specifications are fundamentally technologically
16 inclusive. It's just how you want to approach doing
17 them and how accurate you need them to be.
18 So, I just, I'm only going through this so
19 you don't get fuzzy-minded in terms of thinking this
20 is delivering something new that's never been done
21 before. We built power reactors. We built reactivity
22 control systems out of hammer and tongs type stuff,
23 motors, Tommy fader inverters.
24 We also built them out of SCRs. We used
25 exactly the same spec to build it out of must-fits

(phonetic) or DJTs, power transistors for a more sophisticated system that had a little bit higher performance requirements, same spec all the way along in terms of what the output was.

So, I'm only bringing this up to don't -- keep in mind these are just words. The I&C world has been moving virtually seamlessly from pneumatic and vacuum tubes, which I took in college by the way. I had to do all of the transistors and other stuff on my own, and the microprocessor course I had to take, but all of the specs were the same.

So, just don't get enamored with the fancy words and remembering what you're trying to accomplish, and don't over-think it and make it too complicated. We want applicants to be able to build stuff, not ruminate over it and analyze the hell out of it trying to refine what they don't need to refine, that's all.

I'm sorry for the little soliloquy there, but we're wrapped up in that with all of these different approaches on the advanced reactors. I just want to keep a little bit of a dampening lid on the thought process so we don't get carried away and overdo the thought process and the expense, because if you spend too much money, we'll have no plants at all.

1 I think I'm done with that little soliloquy.

2 MR. ROGGENBRODT: This is Bill

3 Roggenbrodt. Again, we sometimes get wrapped around

4 the axle with, you know, performance-based and those

5 kind of items. The workshop we had a few weeks ago

6 that I was able to attend, speaking to the point of,

7 you know, here is the outcome that you might see and

8 these are the performance requirements you want, but

9 then the discussion on the topic was also okay, but to

10 get to those performance requirements, I think this is

11 what you were saying, Charlie, that's great to get to

12 this power level, this safety margin, those kind of

13 things, but to do that, you still have a need, and you

14 need to closely examine your requirements, your

15 specifications going throughout the system.

16 It can't just be, you know, magically this

17 is what I want at the end. There has to be the

18 underlying how you got there and what the basis for

19 that, again, going back to requirements, which is

20 huge. So, that's --

21 MR. BROWN: Everything I said had

22 requirements associated with it trying to get to the

23 end points.

24 MR. ROGGENBRODT: Absolutely, and it's

25 those kind of items that, you know, you've got to make

1 sure, again, talking about spending time before you
2 get to the end product, but it's the underlying
3 requirements that are going to get you there safely
4 and reliably. Thanks.
5 CHAIR ROBERTS: Yeah, I think, Bill,
6 you're exactly right, that Charlie's sequence of
7 events might be idealized, but there are also examples
8 of cases where the requirements were technology-
9 specific, and sometimes we didn't realize they were
10 technology-specific until we tried to apply them to a
11 different technology and suddenly it didn't work, and
12 I'm sure you know the kinds of examples I'm talking
13 about where if you don't have the right level of
14 requirements, you might actually be technology
15 dependent.
16 So, it's just a matter of making sure the
17 requirements are the functional requirements, and the
18 things that could be technology dependent, you know,
19 aren't buried in the requirements. So, it can be --
20 you know, you can run into some surprises, let's say,
21 if you don't account for that.
22 MR. BROWN: Just to provide a little bit
23 of additional comment on that, when we first went to
24 the microprocessors and we did this with the nuclear
25 instrumentation --

1 CHAIR ROBERTS: Yeah.

2 MR. BROWN: -- the very low range source
3 and intermediate range have always been very, very
4 noisy, very, very difficult to deal with, and
5 everybody eureka, software, software filters. These
6 will work great. So, we actually built equipment
7 using the microprocessors, put it into an SSW class
8 submarine. It was so damn noisy we had to go back in
9 and put analog filters in to make it work right, so.

10 CHAIR ROBERTS: Yeah, I'm thinking of the
11 exact opposite of that that showed up at engineering
12 level testing in the lab, not a ship, fortunately,
13 where the filters worked so well that the SUDLs
14 (phonetic) didn't respond basically at all.

15 (Laughter.)

16 CHAIR ROBERTS: And the software was very
17 good. It was looking for the transients that were
18 defined as hazardous, and so if you had one of those
19 transients, then the filters got turned off, and then
20 the system responded. We kind of forgot to put the
21 requirement in of it should make sense.

22 (Laughter.)

23 CHAIR ROBERTS: But the requirements were
24 written. These were analog-type requirements. There
25 were stretch requirements. The vendors met them with

great margin, but they didn't have the requirement that said it has to make sense.

MR. BROWN: So, the only point is don't get wrapped up in the verbiage that's used for political advertising. Design systems that work is what you want to end up with, and it's a combination of everything else that Sushil was talking about and what you guys are, you know, preparing to do. It's a combination of all of that. All right, I'll get off my podium here for a minute.

MR. DARBALI: All right, thank you for the discussions, and thank you, Sushil, for providing the responses. So, next slide? So, now this and the next slide will be talking about activities related to wireless technology.

MR. BROWN: Do you want me to start another soliloquy?

MR. DARBALI: Let me finish.

(Laughter.)

MR. DARBALI: So, the staff in the Office of Research is also working on various research efforts initiated by NRR research assistance requests on the use of wireless technology.

The purpose of these research activities is to consider advances in wireless communication

technologies, the continued and potential expanded use of such technologies in nuclear power plants, and the protective measures for safety-related systems and components.

The first research activity is RAR-NRR-2021-014, which has been completed. For this effort, the staff, with the assistance of Oak Ridge National Lab, researched the potential impacts from the expanded use of wireless technologies.

The staff concluded that current regulatory guidance in Reg Guide 1.180, Revision 2, concerning the standup distance determination process does not need to be changed and will continue to ensure safety even with new modern wireless modalities. The results of this research activity are captured in the two technical letter reports listed in this slide.

And then on the next slide, we have another research activity. This is, right, this is RAR-NRR-2024-014, which is currently in progress. This research activity is focused on wireless data link reliability and the outcome will identify foundational information to support a technical basis for wireless applications in nuclear power plants, including remote monitoring.

1 The research will document existing
2 information, including current and planned consensus
3 standards, in a way that is technology neutral. The
4 research will also document potential criteria that
5 can be useful for reviewing and qualifying the
6 expanded use of wireless of technology. I am done.
7 DR. BLEY: Yeah, I was a bit surprised
8 reading the read-aheads for this meeting that when you
9 went out and polled the industry, that basically
10 nobody in a safety-critical application was using
11 wireless, and so it sounds like what you're describing
12 here would be you inventing a whole new, you know,
13 technology in terms of what you need to do to support
14 wireless. Is that right or is that obsolete
15 information that somebody else is helping guide the
16 way?
17 MR. DARBALI: So, I'll take a stab, and if
18 somebody from research can correct me? Right, we're
19 not developing new technology. We're trying to be
20 prepared for when these applications would come in.
21 I think for us to think that nobody will ever propose
22 the application of wireless technology is going to put
23 us in a disadvantage once those come in.
24 So, we're trying to look at what other
25 industries are using, what their challenges are, what

1 their lessons learned are, and what would be the
2 impact to apply that to plant systems for different
3 applications, but the idea is to have a better
4 understanding and see what the next activities would
5 be.
6 DR. BLEY: Dennis Bley here with a
7 question for you. We've, in the past, expressed some
8 concern about even having voice wireless
9 communications in the plant. We've pushed really hard
10 on having hardware unit directional connections to our
11 networks. Unless we're building perfect Faraday cages
12 around these plants, if we're starting to control them
13 by radio, I get pretty nervous. How are you digging
14 into that side of it?
15 MR. DARBALI: What was the last part, the
16 last question?
17 DR. BLEY: Okay, you're not using radio
18 signals in these proposed applications to track
19 parameters and other things. Somebody from outside
20 could intercept signals. Somebody from outside could
21 inject signals that could screw this up or just noise
22 unless you had a perfect Faraday cage around the
23 plant, and at least we saw from lightning events some
24 years ago that we don't usually have that even for
25 those kind of events. Are you thinking about possible

1 interference with operations because of this?
2 MR. DARBALI: Right, and there is
3 different research activities with different focus
4 areas. So, I think the NRR-led research activities or
5 NRR-requested research activities focus more on the
6 reliability and the impact on safety. There are some
7 NSIR-initiated research activities that are looking at
8 the cybersecurity aspects of it. Right, again, we're
9 not proposing changing our requirements or our
10 guidance documents to allow for that. I think at this
11 stage, we're just looking at what impacts have been
12 identified.
13 DR. BLEY: Okay, I guess where I was
14 coming from with my comment is I hope whatever reports
15 come out of this don't just talk about those issues,
16 but also talk about the possibility of outside
17 interference with these signals.
18 MR. DARBALI: Okay.
19 MR. CARTE: Norbert Carte, I&C. So, I
20 think we're a little -- so there's different issues
21 with wireless, and right now, no one's talking about
22 protection system parameters being monitored
23 wirelessly or protective actions being taken
24 wirelessly. That's really maybe someday in the
25 future, but that's not what we're talking about.

1 So, there's a lot of different ways that
2 you can get wireless into a facility. One of the ways
3 that has been expressed is if they want to do
4 inspections of hard to reach places using drones and
5 flying drones.
6 Other ideas are, say, operators do rounds
7 and they check local instrumentation. The idea is
8 take those instruments that are currently monitored or
9 looked at occasionally by an operator and written down
10 on a piece of paper, and maybe lettering the operator
11 use a tablet to collect the information, maybe putting
12 a wireless transmitter on a gauge that already exists
13 in the facility and is not really directly used by the
14 operators in that sense, so it's not in the control
15 room, but it's in the facility.
16 So, they're talking about automating
17 everything else and how close can you get to a safety-
18 related device with a wireless device in terms of
19 EMI/RFI. So, those are the types of issues that are
20 being discussed, and yes, NSIR and related discussions
21 are part of that discussion, but we're not talking, at
22 least right now, about sensing or protecting the
23 facility using wireless. It's all about automating
24 everything else in the facility.
25 DR. BLEY: Two quick points. The first

one is I bet if you gave me the ability to control the secondary plant from outside, I could drive that plant into conditions that were never expected when we designed our protective systems or trained our operators.

And two, if you're looking at some of this remote monitoring stuff and drones, if you catch up on what's going on over at Fukushima, you might get some useful -- no, no, I'm serious. They're doing extensive use of drones and different kinds of drones for all sorts of things at those plants now.

MR. CARTE: Right, okay, so, and we haven't actually talked about controlling on the secondary side. It's more automating some of the things that operators do right now and making -- so it's the remote monitoring, not remote control, although eventually that issue is going to need to get addressed. People are talking about remote, autonomous facilities, and eventually that's like basically the equivalent of wireless. It's worse than wireless. So, there is some interest.

If you're going to have a remote facility, how are you going to manage that? And so, it may come up in that context. It's not going to come up in the existing facilities mostly because it's already wired.

The new facilities might propose stuff, but I don't work in that area.

DR. BLEY: I can't get my mic on. There it is. Okay, thanks, Norbert, and that all makes sense, and I guess we'll just watch and use care in the future.

MR. BROWN: I can't resist. In today's -- wireless just means the supporting structures throughout the country because everybody's got their little smart phones, okay, while I'm still stuck with a flip phone, but I'll walk from one part of my house to the other and it goes from signal to no signal.

My neighbor went out to California this past weekend. His air conditioning had failed and he had a technician coming in, so he asked me if I would let the guy in the door and stay with him. Fine with me.

So, he then called me on his phone from California and said okay, it's all set up. He'll be there between this time and this time, and I got a text from him. While he was talking to me, his signal disappeared, and it took about one or two minutes for him to -- he was walking with his family through California in San Diego somewhere, and I said okay.

He finally got back and I said I didn't

1 get a thing you said. He said oh, we must have lost
2 signal, so we went back over it again. He says by the
3 way, call me when you hear from the technician so that
4 I can turn off my alarm system remotely. I then asked
5 him, I said based on your -- how do I know it's off if
6 I'm outside the house? He said, well, you'll know
7 when you open the door.
8 (Laughter.)
9 DR. BLEY: I said that was a good answer.
10 I said well, what is the code? He says, well, I
11 really don't want to give out the code. Well, I don't
12 even know where his panel is, much less what kind of
13 panel he has or how you have to push the buttons.
14 And I said well, so when you're walking
15 around just like we lost you and you've texted me that
16 you've remotely turned it off, how do you know the
17 signal really got there? Well, I don't. So, we
18 finally resolved that and I opened the door.
19 Fortunately, it didn't go off, but his phone also died
20 while he was talking to me.
21 So, I mean, you know, this pie in the sky
22 -- a good friend of mine who does all of her financial
23 actuations on her phone because it's really neat, she
24 can hit all of the institutions and pay this, pay
25 that, order this, order that and everything else, all

1 of a sudden, her phone went blank and lost all data,
2 all of her financial instruments, everything she had.
3 She had no paper.
4 CHAIR ROBERTS: Okay, let's get back --
5 MR. BROWN: My point being is you got to be
6 careful. The whole point is the wireless stuff is so
7 dependent upon stuff outside your ability to control
8 it, internal, you know, walkie-talkies or, you know,
9 it's obviously something you'd like to be able to deal
10 with, but the other stuff has got to be very carefully
11 crafted, that's all.
12 MR. DARBALI: And we agree. Again, this is
13 not an activity to propose the use, but rather, I
14 think, one of these research activities is to look at
15 the reliability of the data link, so we understand and
16 appreciate the concern.
17 CHAIR ROBERTS: Yeah, and Norbert's answer
18 helped. The research is looking at things that are
19 not in the safety path, and are far enough, at this
20 point, far enough away from the safety path that
21 you'll be very careful going past, you know, from a
22 monitoring and that type of thing, a very cautious
23 approach. I just wanted to make sure that was the
24 case because, again, the report you guys pointed out
25 was clear that nobody, it seems like nobody in the

1 country at least has attempted to broach this question
2 of how to control with wireless in the loop.
3 MR. DARBALI: Right, right.
4 CHAIR ROBERTS: So, good.
5 MR. BROWN: Right before I retired, there
6 were a bunch -- there was one of the meetings we had
7 where there was about half a dozen senior plant, not
8 CEOs, but the plant manager type people, the
9 engineering. I asked them some questions about that
10 type of stuff and they said over my dead body.
11 You know, it was uniform that nobody in
12 their right mind would ever do that. And I'm not
13 saying you don't prepare and prepare yourself, and
14 understand what you had to deal with, but implementing
15 in the long run, these plants are far too important to
16 be played with.
17 MR. DARBALI: Understood.
18 CHAIR ROBERTS: Okay, so looking at the
19 schedule, there's one more slide, so I'm thinking we
20 just push on. Otherwise, I saw we're down for a
21 break, but I think we can --
22 MR. DARBALI: Yes.
23 CHAIR ROBERTS: -- close out in the next
24 15, 20 minutes.
25 MR. DARBALI: I'll now turn it over to

1 Jason.

2 MR. PAIGE: Thank you. This is Jason
3 Paige, home stretch. So, this slide summarizes the
4 coordination efforts between the NRC and other
5 organizations domestically and internationally. These
6 efforts are very important to the NRC, and they're a
7 way for us to exchange technical expertise and
8 knowledge, and gain insights for regulating digital
9 I&C activities. And I just want to note that these
10 engagements are very deliberate, and they're a part of
11 our strategic approach for modernizing our I&C
12 regulatory infrastructure.

13 For domestic engagements, the NRC staff
14 held workshops with the advanced reactor community,
15 workshops on licensing lessons learned or identifying
16 lessons learned. So, in addition to the purposes that
17 Dinesh talked about on slide 44, these workshops are
18 part of the NRC staff's efforts to streamline reviews
19 of future license applications, and to ensure common
20 understanding amongst the NRC staff and potential
21 applicants.

22 The NRC staff also had one on one meetings
23 with organizations to share information and inform NRC
24 research activities. For example, there were multiple
25 digital I&C technical exchanges with the DOE's Office

of Nuclear Energy on the light water reactor sustainability program, and this program conducts research to provide guidance to nuclear power stakeholders on the full scale implementation of modernization in nuclear power plants.

For example, Exelon Limerick Generating Station was selected as a reference facility for this research, which is being leveraged by Exelon in support of the digital I&C upgrade LAR as discussed on slide 24.

In addition, NRC staff and EPRI have continued to cooperate on several research areas, including digital I&C topics to gain awareness of the latest EPRI tools for performing analysis of digital I&C systems, including cybersecurity reviews.

For international engagements, the NRC staff continues its engagements on several digital I&C activities to assess how approaches used by other regulatory authorities could improve the efficiency, clarity, and reliability of the NRC's current digital I&C regulatory framework.

The NRC conducts periodic technical exchanges with other regulatory authorities to address digital I&C technical and regulatory challenges that are common to the respective agencies.

1 In addition, the NRC staff lead and
2 participate in ongoing technical and guidance
3 development activities for digital I&C at the
4 International Atomic Energy Agency and the
5 International Electrotechnical Commission.
6 From December 2022 to September 2023, the
7 NRC staff participated in technical meetings,
8 consultancy meetings, and a workshop focused on
9 technical information exchanges to address CCF. The
10 NRC also participates in the working group on digital
11 I&C within OECD Committee on Nuclear Regulatory
12 Activities.
13 These engagements are beneficial in
14 building international technical consensus on common
15 digital I&C issues, and developing standards and
16 technical documents introducing performance-based
17 approaches to safety analysis of digital I&C systems.
18 These coordination efforts are very important in the
19 development and implementation of key NRC digital I&C
20 activities. So, that concludes my presentation. I'll
21 hand it over to Fanta for closing remarks.
22 MS. SACKO: Hi, my name is Fanta Sacko.
23 I am the Chief of the Instrumentation and Controls
24 Branch in DEX NRR, and I'll be providing closing
25 remarks. Thank you for the opportunity to update the

1 Subcommittee on Digital Instrumental and Controls,
2 Infrastructure, and Licensing Activities.
3 We have come a long way since the 2016
4 SRMs and the introduction of the IAP. We have
5 improved our guidance on licensing digital upgrades
6 and developed guidance for the review of digital I&C
7 in advanced non-light water reactor applications.
8 We have reduced regulatory uncertainty,
9 and in recent years, there has been increased industry
10 interest in performing major digital upgrades. We've
11 also completed major policy and guidance development
12 in the area of digital I&C common cause failure that
13 we mentioned earlier.
14 We are now in a position to confidently
15 undertake the incorporation by reference of the 2018
16 version of IEEE 603. We are working with research to
17 support the review of applications that use modern I&C
18 design methodologies.
19 As we have mentioned throughout the
20 presentation, the modernization of developing
21 infrastructure to support licensing applications is
22 complete, and we'll continue to make improvements
23 under our normal processes. Thank you for sharing
24 your insights. We appreciate your feedback. Thank
25 you, Charlie.

1 (Laughter.)

2 CHAIR ROBERTS: Okay, with that, I said at
3 the outset that one of the things that seemed to be
4 missing from the presentation was a listing of the
5 strategic objectives that you're currently working,
6 and at least I jotted down a couple, and maybe I
7 should start with you and see what you got in terms of
8 what you would have as the, more strategically what
9 you're working now.

10 MR. PAIGE: So, I'll try to tackle that
11 first. This is Jason. So, I think you summarized one
12 of the strategic activities in general, the research
13 activities, you know, that's the longer term
14 activities, so I think that's one activity in general.

15 I think also the coordination efforts,
16 that's part of our strategy, the ongoing interactions
17 that we have with industry to understand their needs,
18 for us to communicate our regulatory positions as they
19 develop standards, so I think the coordination efforts
20 is strategic activity.

21 And I think another item that was pointed
22 out in the integrated action plan was our ability to
23 endorse newer standards when they become available, so
24 that's always an ongoing strategic long-term activity
25 that we're undertaking. So, I think those are three

1 that I see in my mind clearly. I don't know if
2 there's any other activities that you guys want to
3 point out?
4 MR. DARBALI: I think the overall
5 organization of our reg guides and regulatory
6 infrastructure, again, long term as we, you know, go
7 through our licensing reviews.
8 CHAIR ROBERTS: That's basically got my
9 list when I went through this. The other one, and
10 maybe it is, you know, a research topic, more of a
11 specific goal of the research is to be able to more
12 predictably assess where for the hazards and determine
13 what the defense-in-depth model of the plant is as it
14 applies to that particular plant design or technology,
15 getting more into what you're trying to get at there.
16 Because it seems like the whole purpose of
17 at least that one research chart was to be able to get
18 at a more streamlined way of a hazards analysis, a
19 more not necessarily streamlined, but more dependable
20 that actually picks up the significant hazards to the
21 extent that you can, you know, put together the
22 defense-in-depth model that would, you know, be
23 sufficient to mitigate those hazards.
24 So, other than that, I think, like I said,
25 I thought at the outset even though it wasn't on the

slides, there seem to be implied throughout the presentation some sort of strategic goals you're currently working, so it may be worthwhile to document them as such just so it's clear to everybody who is listening to you and trying to understand what it is you're trying at, you know, what it is you're trying to get at, you know, in terms of these are the things that the sites --

You know, I don't know if answering the mail is pejorative, but I think everybody knows you have a large workload dealing with the various applications that's coming in, but, you know, everybody knows you're doing that, but how you're getting better and what kinds of problems you're trying to fix. I think it's valuable to make clear what that is.

And with that, if there aren't any more comments, I think it's time to go out for public comment, so does anybody -- I don't think there's anybody in this room, but anybody out there on the Teams link or on the phone line, if you'd like to make a comment, go ahead and, you know, unmute yourself, state your name and affiliation, and make your comment. I see one hand up from Mr. Alan Campbell.

MR. CAMPBELL: Okay, good afternoon. This

is Alan Campbell. Can you hear me?

CHAIR ROBERTS: Yes, go ahead.

MR. CAMPBELL: Okay, perfect. So, I'm Alan Campbell. I work for the Nuclear Energy Institution or NEI, and I lead our work in digital instrumentation and control. So, there are a few things. I wrote some notes down as the presentation has been going on throughout the day, so I'm going to backtrack a little bit to some of the topics that were presented earlier.

First, we'd just like to state an appreciation for the many efforts of the staff to keep the industry engaged and make sure that we're making progress. That's meaningful to the industry both in maintaining and upgrading our existing fleet, but also paving the way for the future fleet.

We believe that the biweekly planning and alignment meetings that we have been doing for the last, at least the last few years that I've been involved in this have really helped us to stay connected and aligned on our priorities.

There was a lot of discussion earlier this morning on the use of some of the products that have been endorsed. I just wanted to point out that, first of all, a lot of the IAP efforts produced immediate

1 results that were adopted by the industry quickly.
2 So, improvements in 50.59 guidance, the
3 qualitative assessments for common cause failure, the
4 alternative review process, and ISG-06, these were all
5 things that have been implemented throughout the
6 industry. Obviously with the alternate review
7 process, there's a little bit slower movement on that,
8 but I think the major point to consider here is that
9 these are major investments that utilities are making.
10 And previously, you know, up to some of
11 these changes, these safety system and protection
12 system upgrades weren't being aggressively pursued by
13 the licensees, and so we're still in kind of this, you
14 know, the nuclear -- you know, everyone wants to kind
15 of line up these second, third, fourth, so we're
16 looking forward to the success of these first few
17 projects here.
18 One of the other contributing factors here
19 is that many of the licensees have focused their
20 resources on full fleet modernization strategies and
21 workforce development to support that, and so this is
22 outside of the regulatory space, and we have been
23 working on maturing our design and lifecycle
24 management processes through the standardized design
25 process and the digital supplement to that.

1 So, we are looking forward to a wave of
2 digital efforts that are connected to these
3 modernization strategies and the workforce development
4 that has been ongoing in the industry.
5 Specific with Reg Guide 1.250, I know that
6 was a topic of conversation a good bit this morning
7 with the commercial grade dedication using this filter
8 certification. You know, this was an area that we
9 still believe has a lot of benefit to the industry.
10 There have been some limiting factors here
11 that have kind of limited the scope of where we can
12 use Reg Guide 1.250, and we're continuing to work to
13 help, one, broaden that scope through the use of other
14 products.
15 Right now, we're only able to use products
16 used by the U.S. that have been certified through
17 certification bodies in the U.S. We are continuing to
18 pursue the German accreditation and certification
19 bodies there that would help broaden the supply chain
20 even more.
21 And other factors in this, we do believe
22 that with an uptick in advanced reactors, that will
23 put pressure on the supply chain, and that guidance,
24 while it has been slow to be adopted, we believe that
25 it will be very important as more pressure gets put on

1 the supply chain.

2 And just in general, you know, for our

3 strategic outlook, we're continuing to look towards,

4 you know, fleet modernization to help drive, you know,

5 future safety and protection system modifications, as

6 well as supporting new reactor designs, and we're

7 really looking at the integration of digital with

8 other areas of consideration such as human factors and

9 then also build-ins, a lot of lessons learned that

10 we've learned through the design and licensing

11 processes over the last few years. So, that's all I

12 had to contribute for today.

13 CHAIR ROBERTS: Okay, thank you. Are

14 there any other members of the public who would like

15 to make a comment? All right, seeing and hearing

16 none, the next step will be any discussion among the

17 members.

18 I'd like to start by saying I really

19 appreciate the presentation that the staff put

20 together here. It's given me a lot of perspective,

21 even after reading three pages of references that you

22 all sent in advance of this. Just having it put

23 together like this and hearing what you all are doing

24 is very helpful, and hopefully some of the comments

25 you heard might help you.

1 It's worthwhile to remind you that
2 anything that anybody said here is their opinion, and
3 you've probably heard what you can say about opinions,
4 so if they made sense to you and there's something
5 that you would appreciate having the insight and we
6 want to own it, then that's where we are. If we have
7 a discussion, and we will on some of these topics, you
8 know, later when they're ready for review, and then it
9 might be a different story, but now this is all
10 whatever you want to do with them is, you know, have
11 fun.
12 With that, my intent going on was this
13 would be a presentation for information. I didn't
14 hear anything that would change my view that this was
15 a great information exchange, and I don't know that we
16 would need to do any more in terms of full committee
17 review or any formal feedback.
18 So, I guess I'll open it up to any of the
19 members in the room, consultants in the room, or folks
20 online, members or consultants. Do you have other
21 views or other comments you'd like to make?
22 DR. SCHULTZ: I'll just make a comment.
23 No real other views, but I did appreciate Alan
24 providing NEI's views about his comments or industry's
25 comments related to the work that the staff is going

1 here.

2 He mentioned two things that I think are

3 really important. One is that the work is really

4 headed in the right direction, complemented the two-

5 week inter-meetings between industry and the agency.

6 And I know that's been going on for quite some time

7 now and it's very clear that that's valuable on both

8 sides of the fence, if you will, and I'm glad to hear

9 that, and that's continuing and really providing good

10 progress going forward.

11 I was interested to hear also about the

12 both national and international activities that the

13 I&C staff are involved with. That's always been

14 important, but continuing in that vein, as was

15 mentioned here, there are some opportunities in other

16 countries that we need to follow in order to improve

17 our knowledge and abilities here.

18 The other comment that was made, we talked

19 about a little bit here today. We did mention that

20 things were moving a little bit slowly in terms of

21 applications coming in. I can see that there might be

22 a tidal wave coming that the staff needs to prepare

23 for.

24 I think we will be, in fact, through the

25 nth of a kind of reviews, we hope fairly shortly. I'm

1 glad to hear that industry is really working to not
2 only get ready for that, but do training, staff
3 training and preparation that should make the nth of
4 a kind application process work well from the industry
5 side, and it should make, with the improvements that
6 you've proposed here, with the regulatory guidance and
7 implementation, that should make that really good on,
8 again, both sides of the application and review.
9 So, I think the committee will look
10 forward to that because that -- good treatment of nth
11 of a kind makes it very, much easier for the committee
12 to move forward. That's what we found out with our
13 overall approach to subsequent license renewal, those
14 types of projects where nth of a kind of really
15 helping move forward in the licensing reviews. Thanks
16 for the presentations today. It was very well-
17 organized and nicely done.
18 MEMBER HALNON: So, Tom, this is Greg. I
19 agree with everything that's been said. It was a
20 great presentation today. I still remain somewhat,
21 even with the discussion Alan just had, and the set of
22 workshops that's been going on, and the every two-week
23 engagement, I still don't quite get it, why we spent
24 three years on a reg guide and nobody's using it.
25 And I realize it wasn't three full-time

1 years, but it just seems like our resources are
2 stretched enough that we should have a good idea of if
3 the work we're putting into some of these items or
4 products are going to be useful.
5 So, I remain concerned about the resources
6 that we have on this, and if we do realize that value
7 that Steve was talking about, you know, we're not
8 going to have the ability to spend a lot of time on
9 guidance that nobody's going to use. So, you know,
10 other than all of the accolades we've been hearing,
11 that's the only counter that I would have to where I
12 continue to be concerned.
13 CHAIR ROBERTS: Thanks, Greg. So, hearing
14 nothing additional, again thank you very much for this
15 presentation and I look forward to the next
16 interchange, be that coming up in October for Limerick
17 or whatever it is, and with that, the meeting is
18 adjourned.
19 (Whereupon, the above-entitled matter went
20 off the record at 3:27 p.m.)
21
22
23
24
25

Periodic Update of Digital Instrumentation and Controls (DI&C) Infrastructure and Licensing Activities

Digital I&C ACRS Subcommittee Meeting

June 27, 2024

Tania Martinez-Navedo, Director, Division of Engineering and External Hazards

Jason Paige, Chief, Long-Term Operations and Modernization Branch

Fanta Sacko, Chief, Instrumentation and Controls Branch

Dinesh Taneja, Sr. Electronics Engineer, Long-Term Operations and Modernization Branch

William Roggenbrodt, Electronics Engineer, Instrumentation and Controls Branch

Samir Darbali, Electronics Engineer, Long-Term Operations and Modernization Branch

U.S.NRC

United States Nuclear Regulatory Commission

Protecting People and the Environment

Purpose

Purpose: Brief Digital Instrumentation and Controls (DI&C) ACRS Subcommittee on the status of key digital I&C regulatory activities

Outcome: ACRS gains a better understanding of infrastructure and licensing activities related to digital I&C topics

Outline

- Opening Remarks
- Background
- NRC DI&C Activities (Completed and Ongoing)
  - Regulatory Infrastructure Modernization
    - Regulatory Infrastructure Organization
    - Policy and Rulemaking
    - Guidance Development
    - Generic Communications
  - Licensing and Topical Reports
    - Operating Reactor Modernization
      - ISG-06 Licensing Process
      - Operating Reactor Licensing Reviews
    - New and Advanced Reactor Licensing
    - Topical Reports
  - Research
    - I&C Guidance Modernization
    - New Technologies for Nuclear I&C Applications
- Coordination Efforts
- Closing Comments

Background

- The Commission issued SRM-SECY-15-0106 (February 25, 2016)
  - Directed the staff to develop an integrated strategy to modernize the NRC's I&C regulatory infrastructure.
- The Commission issued SRM-SECY-16-0070 (October 25, 2016)
  - Approved the implementation of the staff's Integrated Action Plan (IAP) to modernize the NRC's I&C regulatory infrastructure.
- Tactical Objectives
  - Continue to prioritize and implement the regulatory activities needed to provide regulatory clarity and support industry confidence to perform digital I&C upgrades.
- Strategic Objectives
  - Strategic - Assess and implement broader modernization of regulatory infrastructure.

Background

- The IAP included four Modernization Plan (MP) areas:
  - MP1 – Protection Against Common Cause Failure
    - MP #1A – Regulatory Issue Summary (RIS) 2002-22, Supplement 1
    - MP #1B – Review of NEI 16-16
    - MP #1C – Implementing Commission Policy on Protection against CCF in DI&C Systems
  - MP2 – Considering DI&C Controls in accordance with 10 CFR 50.59
  - MP3 – Acceptance of Digital Equipment
  - MP4 – Assessment for Modernization of the I&C Regulatory Infrastructure
    - MP #4A – ISG-06 Revision
    - MP #4B – Broader Modernization Activities
- All activities identified in the IAP have been completed.

Background

- The staff issued SECY-19-0112 (November 2019).
  - Vision is to have a clear regulatory infrastructure with reduced regulatory uncertainty that enables the expanded use of digital I&C in commercial nuclear reactors while continuing to ensure safety and security.
- The staff's infrastructure modernization effort to support licensing applications is complete.
- The staff continues to make improvements under our normal processes.

NRC DI&C Activities

Regulatory Infrastructure Modernization

- Policy and Rulemaking
- Guidance Development
  - Industry Guidance
  - Staff Guidance
- Generic Comms.

Licensing and Topical Reports

- Operating Reactor Modernization
  - DI&C LARs
- New and Advanced Reactor Licensing
  - SMRs
  - Non-LWRs
- Topical Reports

Research

- I&C Guidance Modernization
- New Technologies for Nuclear I&C Applications

NRC DI&C Activities

Regulatory Infrastructure Modernization

- Policy and Rulemaking
- Guidance Development
  - Industry Guidance
  - Staff Guidance
- Generic Comms.

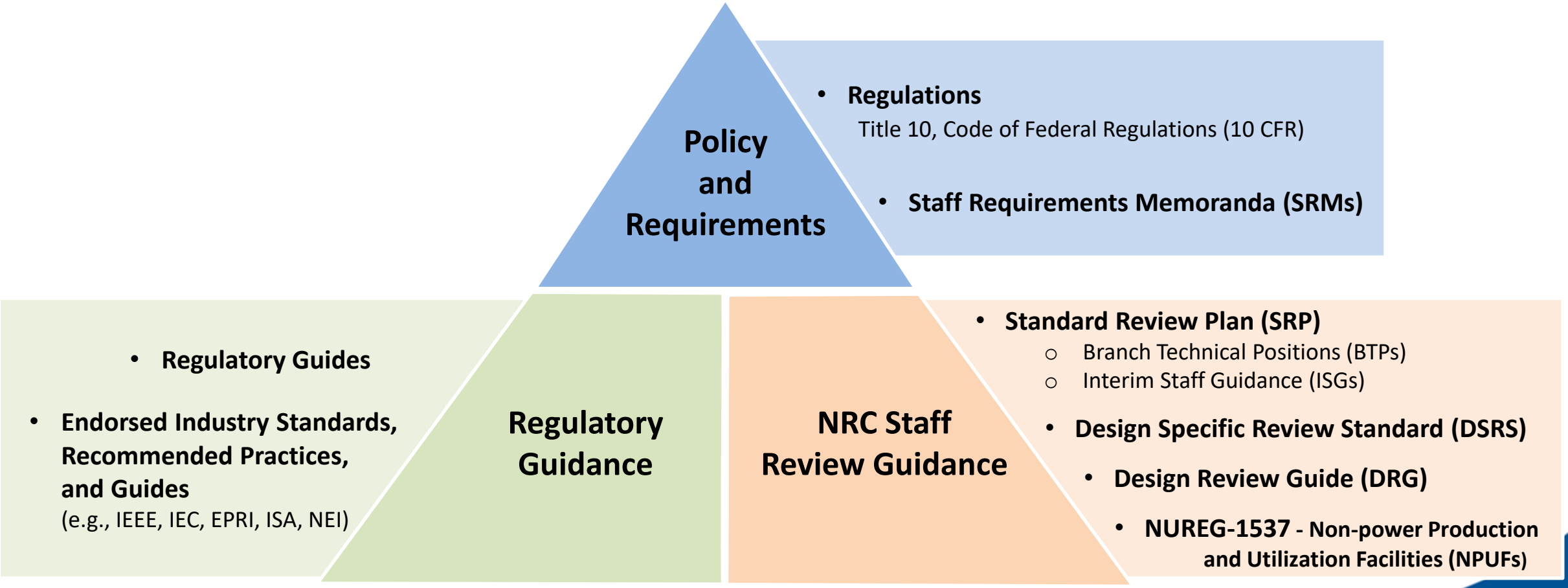
Licensing and Topical Reports

- Operating Reactor Modernization
  - DI&C LARs
- New and Advanced Reactor Licensing
  - SMRs
  - Non-LWRs
- Topical Reports

Research

- I&C Guidance Modernization
- New Technologies for Nuclear I&C Applications

NRC I&C Licensing Infrastructure



NRC I&C Staff Review Guidance

NRC Staff Review Guidance

- **Standard Review Plan (SRP)**
  - Branch Technical Positions (BTPs)
  - Interim Staff Guidance (ISGs)
- **Design Specific Review Standard (DSRS)**
- **Design Review Guide (DRG)**
- **NUREG-1537 - Non-power Production and Utilization Facilities (NPUFs)**

Document	Description
SRP Chapter 7, BTPs, ISGs	Licensing review guidance for Light Water Reactors (LWR)
DSRS Chapter 7	Design specific review standard (e.g., NuScale)
DRG	Generic licensing review guidance for non-LWR reactors
NUREG-1537	Licensing review guidance for NPUFs

Regulatory Infrastructure Organization

- Staff briefed the ACRS on April 5, 2023, on the NRC I&C regulatory infrastructure for reactors.
- Staff is making updates to the mapping diagrams (as needed) and placing the updated slides on the NRC's public website for Modernizing the Regulatory Infrastructure for Digital I&C. (https://www.nrc.gov/reactors/digital/modernize.html)

Criteria for Safety Systems

Criteria for Safety Systems

Regulatory Requirements & Policy

10 CFR Part 50
Construction Permit (CP), Operating License (OL)

10 CFR Part 52
Design Certification (DC), Combined Operating License (COL), Standard Design Approval (SDA), Manufacturing License (ML)

10 CFR Part 50, Appendix A
General Design Criteria 1,2,4,13,19, 20,21,22,24,25,29,34

10 CFR Part 50, Appendix B
Quality Assurance Criteria

50.55a(h)
IEEE Std 603-1991
IEEE Std 279-1971

SRM-SECY-22-0076, SRM-SECY-93-087 *
Item 18

Regulatory Guidance

RG 1.22, Rev. 0
Periodic Testing of Protection System Actuation Functions

RG 1.28, Rev. 5
Quality Assurance Program Criteria (Design and Construction)
→ **ASME NQA-1b-2011 Addenda to NQA-1-2008, NQA-1-2012, and NQA-1-2015**

RG 1.30, Rev. 1
Installation, Inspection, and Testing for Class 1E Power, Instrumentation, and Control Equipment at Production and Utilization Facilities
→ **IEEE Std 336-2020**
Recommended Practice for Installation, Inspection, and Testing for Class 1E Power, Instrumentation, and Control Equipment at Nuclear Facilities

RG 1.47, Rev. 1
Bypassed and Inoperable Status Indication for NPP Safety System

RG 1.53, Rev. 2
Application of the Single-Failure Criterion to Safety Systems
→ **IEEE Std 379-2000**
Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems

RG 1.62, Rev. 1
Manual Initiation of Protection Actions

RG 1.75, Rev. 3
Independence of Electrical Safety Systems
→ **IEEE Std 384-1992**
Standard Criteria for Independence of Class 1E Equipment and Circuits

RG 1.118, Rev. 3
Periodic Testing of Electric Power and Protection Systems
→ **ANSI/IEEE Std 338-1987**
Criteria for Periodic Surveillance Testing

RG 1.153, Rev. 1
Criteria for Safety Systems

Staff Guidance

NUREG-0800
Standard Review Plan, Chapter 7 – I&C
7.1 – Introduction,
7.2 - Reactor Trip System,
7.3 - Engineered Safety Features Systems,
7.4 - Safe Shutdown Systems,
7.5 - Information Systems Important to Safety,
7.6 - Interlock Systems Important to Safety,
7.7 - Control Systems,
7.8 - Diverse Instrumentation and Control Systems,
7.9 - Data Communication Systems

BTP 7-8
Guidance for Application of Regulatory Guide 1.22

BTP 7-19 *
Guidance for Evaluation of Defense-in-Depth and Diversity to Address CCF due to Latent Design Defects in Digital I&C Systems

ISG-06 *
Licensing Process
(D.1 – System Description,
D.2 – System Architecture,
D.6 – IEEE Std 603/IEEE Std 7-4.3.2 Compliance/Conformance)

*Digital-Specific

Criteria for Safety System Programmable Digital Devices

Criteria for Safety System Programmable Digital Devices

Regulatory Requirements & Policy

10 CFR Part 50
CP, OL

10 CFR Part 52
DC, COL, SDA, ML

10 CFR Part 50, Appendix A
General Design Criteria 21

10 CFR Part 50, Appendix B
Quality Assurance Criteria

50.55a(h)
IEEE Std 603-1991
IEEE Std 279-1971

SRM-SECY-22-0076, SRM-SECY-93-087 *
Item 18

Regulatory Guidance

RG 1.152, Rev. 4
Criteria for Programmable Digital Devices in Safety-Related Systems of NPPs

→

IEEE Std 7-4.3.2-2016
Standard Criteria for PDDs in Safety Systems of Nuclear Power Generating Stations

Applicable IEEE Std 7-4.3.2-2016 Clauses	
5.1	Single-Failure Criterion
5.5	System Integrity
5.5.1	Design for PDD Integrity
5.5.2	Design for Test and Calibration
5.5.3	Fault Detection and Self-Diagnostics
5.5.4	Prioritization of Functions
5.6	Independence
5.7	Capability for Testing and Calibration
5.8	Information Displays
5.9	Control of Access
5.11	Identification
5.15	Reliability
5.16	Common Cause Failure Criteria
5.18	Simplicity

Staff Guidance

NUREG-0800
Standard Review Plan, Chapter 7

BTP 7-17 *
Guidance on Self-Test and Surveillance Test Provisions

BTP 7-19 *
Guidance for Evaluation of Diversity and Defense-in-Depth in Digital Computer-Based I&C Systems

BTP 7-21 *
Guidance on Digital Computer Real-Time Performance

ISG-04 *
Highly-Integrated Control Room Communications

ISG-06 *
Licensing Process
(D.1 – System Description,
D.2 – System Architecture,
D.5 – Applying a Topical Report,
D.6 – IEEE Std 603/IEEE Std 7-4.3.2 Compliance/Conformance,
D.8 – SDOE)

*Digital-Specific

Policy and Rulemaking

SRM-SECY-22-0076, Staff Requirements—SECY-22-0076—Expansion of Current Policy on Potential Common-Cause Failures in Digital Instrumentation and Control Systems”

- Issued in May 2023.
- The Commission approved the staff’s recommendation to expand the existing policy for digital I&C CCFs to allow the use of risk-informed approaches to demonstrate the appropriate level of defense-in-depth, subject to the edits provided in the updated four points.
- The Commission directed the staff to clarify, in the implementing guidance, that the new policy is independent of the licensing pathway selected by the reactor licensees and applicants.

Policy and Rulemaking

Incorporation by Reference of IEEE Std 603-2018, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations"

- Currently, 10 CFR 50.55a(h) incorporates by reference (IBR) IEEE Std 603-1991[1].
  - This standard is over 30 years old and has undergone multiple revisions (1998, 2009 and 2018).
  - Many applicants and vendors use more recent versions than IEEE Std 603-1991.
- The effort to IBR IEEE Std 603-2018 has two objectives:
  - Provide industry with the regulatory confidence to use the 2018 version of the standard in the development of safety related I&C systems; and
  - Streamline NRC's ability to endorse new and improved standards that are developed to address digital technology advancements.

[1] 10 CFR 50.55a(h) also IBRs IEEE 279-1968 and/or IEEE 279-1971 for protection and safety systems for power plants licensed before May 13, 1999.

Policy and Rulemaking

Incorporation by Reference of IEEE Std 603-2018, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations"

- IEEE 603-2018 includes clause 5.16, "Common-cause Failure," for addressing CCFs that create a potential to degrade or defeat the safety system function.
- The goal is to IBR the entire 2018 standard with minimal exceptions.
- A public meeting is planned for 3rd quarter 2024.

Guidance Development

Completed RGs

- **RG 1.152, Revision 4**, "Criteria for Programmable Digital Devices in Safety-Related Systems of Nuclear Power Plants" (July 2023)
  - Endorses, with some exceptions and clarifications, IEEE Std 7 4.3.2-2016, "IEEE Standard Criteria for Programmable Digital Devices in Safety Systems of Nuclear Power Generating Stations."
  - Briefed ACRS on DG (late 2022) and final RG (mid 2023), addressed ACRS recommendations on DG.
- **RG 1.250, Revision 0**, "Dedication of Commercial-Grade Digital Instrumentation and Control Items for Use in Nuclear Power Plants" (October 2022)
  - Endorses, with clarifications, NEI 17-06, "Guidance on Using IEC [International Electrotechnical Commission] 61508 Safety Integrity Level (SIL) Certification to Support the Acceptance of Commercial Grade Digital Equipment for Nuclear Safety Related Applications," Revision 1.
  - Briefed ACRS on final RG (Fall 2022).
- **RG 5.71, Revision 1**, "Cybersecurity Programs for Nuclear Power Reactors" (February 2023)
  - Clarifies guidance on defense-in-depth for cybersecurity, clarifies issues identified from NRC cybersecurity inspections, and updates guidance based on the latest NIST and IAEA cybersecurity guidance.
  - Briefed ACRS on DG (late 2021) and addressed ACRS recommendations on DG.

Guidance Development

Software Development (RGs 1.168 – 1.173)

- Consistent with the recommendations in the TLRs related to RAR NRR-2020-016, the next steps will occur in two steps:
  - Update RG 1.168, (Revision 3), then
  - Explore the organization of the software development RGs (RGs 1.168 – 1.173) to determine improvements, level of effort and maintenance involved.

Guidance Development

Plans for Periodic RG Updates

- RG 1.53, “Application of the Single-Failure Criterion to Safety Systems”
  - Revision 2 issued in 2003 endorses IEEE Std 379-2000, “IEEE Standard for Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems.”
  - IEEE Std 379-2014 is the latest revision of the standard.
  - Periodic review (PR) of RG 1.53 was published in December 2016.
    - No immediate technical or regulatory issues with the current revision of RG 1.53 were identified.
    - An issue identified for future consideration is the need for alignment between RG 1.53 and the other regulatory infrastructure modernization efforts on addressing CCF.
    - No impact to not updating the RG to address the issue for further consideration.
  - Next PR due 12/2026.

Guidance Development

Plans for Periodic RG Updates

- RG 1.62, “Manual Initiation of Protective Actions”
  - Revision 1 issued in 2010 .
  - PR of RG 1.62 was published October 2017.
    - No immediate technical or regulatory issues with the current revision of RG 1.62 were identified.
    - An administrative issue identified for future consideration is the need for alignment of the wording that is common between the guidance provided in RG 1.62 and BTP 7-19.
    - No impact to not updating the RG to address the administrative issue.
  - Next PR due 10/2027.

Guidance Development

BTP 7-19, Revision 9, "Guidance for Evaluation of Defense in Depth and Diversity to Address Common-Cause Failure Due to Latent Design Defects in Digital Instrumentation and Control Systems"

- Issued in May 2024.
- Implements the expanded policy in SRM-SECY-22-0076.
- Allows the staff to review risk-informed applications.
- May result in use of design techniques other than diversity.
- Briefed ACRS on BTP and addressed ACRS recommendation on Section B.3.4.4.

Inspection Guidance

DI&C Operating Experience Smart Sample (OpESS) 2023/01, "Digital Instrumentation and Controls"

- Issued in February 2024.
- Provides support to baseline inspection activities in the area of DI&C modifications.
- Provides examples where deficiencies may be present in DI&C equipment in order to inform the inspection of design, modification, and maintenance activities.
- Past DI&C related audit and inspection activities have identified licensee issues with establishing and maintaining the design control, maintenance, and testing of DI&C equipment.
- Operating experience examples:
  - a modification was performed without adequately evaluating and documenting the possibility of a digital CCF not previously been evaluated
  - incorrect wiring resulted in a main turbine trip from the initiation of one single channel instead of the designed two-out-of-three channel logic

Inspection Guidance

DI&C Operating Experience Smart Sample (OpESS) 2023/01, "Digital Instrumentation and Controls"

- Includes inspection guidance on DI&C to support baseline inspection activities:
  - design control (supports IP 71111.21M, "Comprehensive Engineering Team Inspection")
  - test and maintenance of equipment important to risk (supports IP 71111.24, "Testing and Maintenance of Equipment Important to Risk")
  - plant modifications (supports IP 71111.18, "Plant Modifications")
  - cybersecurity (supports IP 71130.10, "Cybersecurity")
  - commercial grade dedication (supports 71111.21N.03, "Commercial Grade Dedication")
  - age-related degradation (supports IP 71111.21N.04, "Age-Related Degradation")
  - problem identification and resolution (supports IP 71152, "Problem Identification and Resolution," and IP 71111.21M, "Comprehensive Engineering Team Inspection")

Industry Guidance

NEI 20-07, "Guidance for Addressing Common Cause Failure in High Safety-Significant Safety-Related Digital I&C Systems"

- Staff has engaged in pre-submittal discussions with NEI since Draft B was submitted in August 2020.
- Draft E submitted in July 2023 – first attempt at defining a risk-informed graded approach in alignment with the revised CCF policy (SRM-SECY-22-0076).
- Proposes a risk-informed graded approach and an iterative systems engineering process for addressing digital I&C CCFs.
- Proposes to use a safety case (Claims, Arguments, Evidence) for presenting the results to the regulator.

Industry Guidance

NEI 20-07, "Guidance for Addressing Common Cause Failure in High Safety-Significant Safety-Related Digital I&C Systems"

- NRC staff provided comments which were discussed during three public meetings (March-April 2024).
- NEI plans to:
  - revise NEI 20-07 and incorporate staff comments
  - hold a tabletop exercise later in 2024
  - submit Rev. 0 for NRC endorsement by the end of 2024
- NEI 20-07 will be reviewed as a topical report which can be referenced by applicants in a licensing application.

Generic Communications

Draft Regulatory Issue Summary (RIS), "Pre-Application Communication and Scheduling for Licensing Actions Related to Digital Instrumentation and Controls"

- Issued for public comments in December 2023.
- NRC seeks scheduling information for preapplication activities and submittal of applications (e.g., LARs) related to DI&C from all addressees to help inform the NRC's budget and resource planning.
- Voluntary information requested includes: estimated LAR submittal and pre-application timeframe, plant systems to be upgraded, I&C platforms to be used, and intended licensing process.

NRC DI&C Activities

Regulatory Infrastructure Modernization

- Policy and Rulemaking
- Guidance Development
  - Industry Guidance
  - Staff Guidance
- Generic Comms.

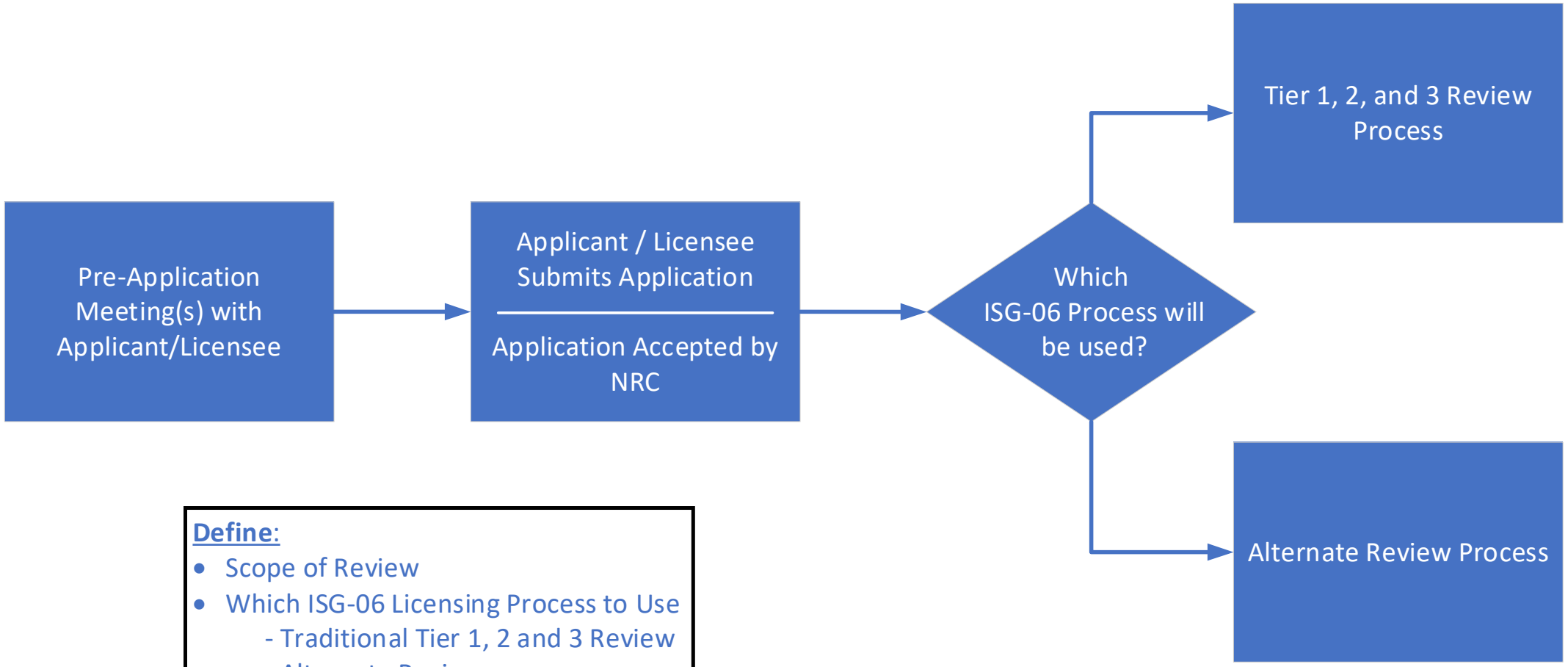
Licensing and Topical Reports

- Operating Reactor Modernization
  - DI&C LARs
- New and Advanced Reactor Licensing
  - SMRs
  - Non-LWRs
- Topical Reports

Research

- I&C Guidance Modernization
- New Technologies for Nuclear I&C Applications

ISG-06 Licensing Process



Define:

- Scope of Review
- Which ISG-06 Licensing Process to Use
  - Traditional Tier 1, 2 and 3 Review
  - Alternate Review
- Where is the applicant / licensee in the development process?

ISG-06 Licensing Process

Tiered Review Process

- The license amendment is typically issued after factory acceptance testing (FAT), followed by inspection of site acceptance testing (SAT) and site installation.
- Based on the evaluation of:
  - an NRC approved platform (Tiers 1 and 2)
  - new system design and architecture
  - system requirements
  - design outputs

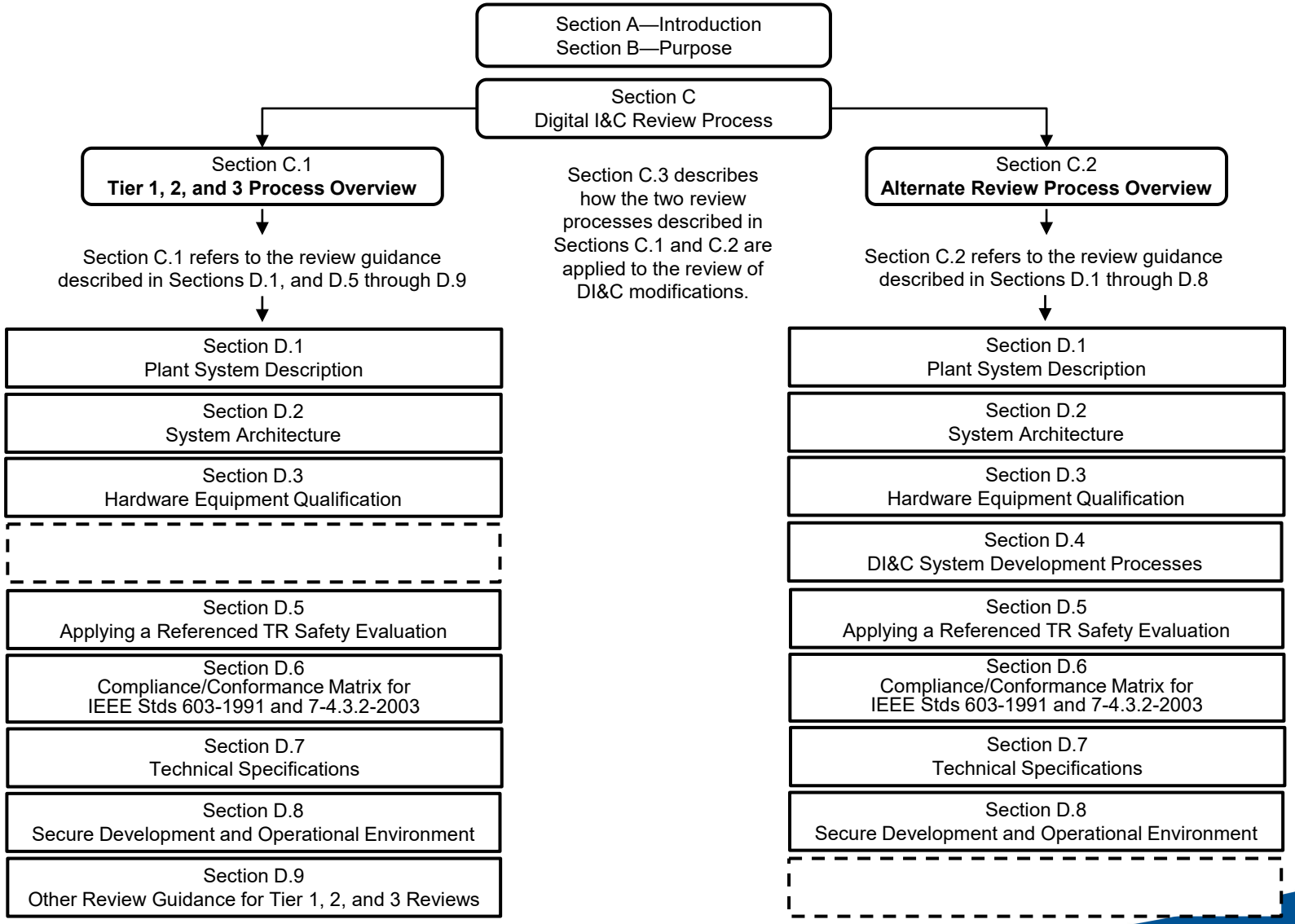
Alternate Review Process

- The license amendment is typically issued before implementation and testing of the design, followed inspections of the FAT, SAT and site installation.
- Based on the evaluation of:
  - an NRC approved platform
  - new system design and architecture
  - system requirements
  - development plans and processes, including the licensee's vendor oversight plan
  - licensee commitments to implement those plans and processes

ISG-06 Licensing Process

- The licensing review includes:
  - **New System Architecture**
    - New system functions
    - System Interfaces
    - Fundamental design principles of redundancy, independence, deterministic behavior, defense-in-depth and diversity, and control of access
  - **Hardware equipment qualification**
  - **System and software development outputs** (Tiered Review Process only)
  - **System and software development processes** (ARP only)
  - **Vendor oversight plan** (ARP only)
  - **Application of a previously-approved Topical Report**
  - **Compliance with IEEE Std 603 and Conformance with IEEE Std 7-4.3.2**
  - **Technical Specifications**
  - **Secure Development and Operational Environment**

DI&C-ISG-06 Rev. 2 Structure



ISG-06 Figure B-1

I&C Technical Areas & ISG-06, "Licensing Process"

Criteria for Safety Systems

D.1 – System Description
D.2 – System Architecture
D.6 – IEEE Std 603/IEEE Std 7-4.3.2 Compliance/Conformance

Criteria for Safety System Programmable Digital Devices

D.1 – System Description
D.2 – System Architecture
D.5 – Applying a Topical Report
D.8 – Secure Development and Operational Environment
D.6 – IEEE Std 603/IEEE Std 7-4.3.2 Compliance/Conformance

Digital Development and Reliability

D.4 – Digital I&C System Development Processes
D.8 – Secure Development and Operational Environment
D.9 – Other Review Guidance for Tier 1, 2, and 3 Reviews

Commercial Grade Dedication

D.9.9 – Commercial-Grade Dedication of Digital Equipment

Equipment Qualification

D.3 – Hardware Equipment Qualification

Setpoint Establishment and Maintenance

D.7 – Technical Specifications

ISG-06, Rev. 2 does not provide specific licensing review guidance for

- Accident Monitoring Instrumentation
- Instrument Sensing Lines

Operating Reactor Licensing Reviews

Turkey Point Units 3 & 4

- Florida Power & Light (FPL) submitted a license amendment request in 2022 for an analog-to-digital replacement of the reactor protection system and engineered safety features actuation system.
- Based on the Framatome Tricon V10 platform topical report.
- In June 2023, the licensee requested the NRC temporarily suspend its review.
- In June 2024, the licensee requested withdrawal of the LAR because it decided not to proceed with the digital modification at this time.

Operating Reactor Licensing Reviews

Limerick Units 1 & 2

- Constellation submitted a license amendment requested in 2022 for an analog-to-digital replacement of the reactor protection system, nuclear steam supply shutoff system, and emergency core cooling system.
- The new digital Plant Protection System is based on the Westinghouse Common Q platform topical report.
- The staff is working on completing the LAR review.
- Licensee is planning to install the PPS in the 2026 and 2027 refueling outages.

Operating Reactor Licensing Reviews

Peach Bottom Units 1 & 2

- Pre-application meeting held on May 14, 2024.
- Constellation is planning to submit in April 2025 a license amendment request for a digital-to-digital replacement of the Emergency Core Cooling System (ECCS) and Post Accident Monitoring System (PAMS) Compensated Level.
- The Curtiss-Wright Digital Safety System will be used for the ECCS.
  - Based on the FPGA-based RadICS platform provided to Curtiss-Wright by RPC Radics LLC.

New and Advanced Reactor Licensing

Guidance Documents – Non-LWR Advanced Reactors

- RG 1.233, “Guidance for a Technology-Inclusive, Risk-Informed, and Performance-Based Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light-Water Reactors” that endorses NEI 18-04
- RG 1.253, “Guidance for a Technology-Inclusive Content of Application Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light-Water Reactors”
- DNRL-ISG-2022-01, “Review of Risk-Informed, Technology-Inclusive Advanced Reactor Applications—Roadmap,” and Advanced Reactor Content of Application Project (ARCAP) related DNRL-ISG-2022-01 thru DNRL-ISG-2022-09
- Design Review Guide (DRG): Instrumentation and Controls for Non-Light-Water Reactor (Non-LWR) Reviews

New and Advanced Reactor Licensing

Advanced Non-LWR Licensing

- Kemmerer CP Application (Natrium) – In Review
  - Natrium is a TerraPower and GE-Hitachi Technology
  - Incorporates by reference "Natrium I&C Architecture & Design Basis Topical Report"
  - Kemmerer CP/OL applications to address preliminary information in the I&C topical report (TR) and expected "Limitation & Conditions" in the SE

New and Advanced Reactor Licensing

Advanced Non-LWR Licensing

- Kairos Hermes 2 CP Application – In Review
  - Under ACRS interactions
  - Final SE issuance expected by Nov 2024
- Long Mott CP Application (X-Energy XE-100) – Dec 2024
  - In pre-application engagements
  - Expect CP application in Dec 2024

New and Advanced Reactor Licensing

New LWR – SMR Licensing

- NuScale US460 SDA Application – In Review
  - SE is on schedule for ACRS presentation in Aug 2024
  - I&C architecture is same as the certified design
  - A few changes in safety function logics
  - Changed RPV water level sensor technology
- Clinch River CP Application (BWRX-300) – Dec 2024
  - In pre-application engagements
  - I&C design contingent on BWRX-300 safety strategy TR review
  - Expect CP application in Dec 2024

New and Advanced Reactor Licensing

New LWR – SMR Licensing

- Holtec SMR-300
  - In pre-application engagements
  - SMR-300 I&C design TR expected by 2025 end
  - CP application expected in June 2026

New and Advanced Reactor Licensing

Research & Test Reactors and Fuel Cycle Facilities Licensing

- SHINE OL Application (Medical Isotopes) – In Progress
- Kairos Hermes 1 OL Application (RTR) – 4th Quarter 2024
- ACU CP Application (RTR) – In Progress
  - I&C SE input provided to PM
  - 18-Month CP application review due Sep 2024
- X-Energy (Fuel Cycle Facility) – In Progress

New and Advanced Reactor Licensing

Topical Reports Under Review

- Natrium I&C Architecture & Design Basis Topical Report
  - Audit plan in preparation
- BWRX-300 Safety Strategy Topical Report
  - Audit plan in preparation
- MELTAC I&C Platform Topical Report Revision (Holtec SMR-300)
- Advanced Logic System (ALS) v2 Topical Reports (eVinci Micro Reactor)

New and Advanced Reactor Licensing

Topical Reports Under Review

- Advanced Logic System (ALS) v2 Topical Reports (eVinci Micro Reactor)
  - Completed SE of ALSv2 Topical Report and Development Process Topical Report
  - ALSv2 TS Surveillance Requirements Functional Tests Elimination Topical Report review in progress

New and Advanced Reactor Licensing

Stakeholder Engagement

- Periodic Workshops on use of LMP/DRG for I&C design (https://www.nrc.gov/reactors/new-reactors/advanced/modernizing/guidance/digital-instrumentation-and-control.html)
  - Meeting summaries are posed in NRC public webpage "Digital Instrumentation and Controls (I&C)"
  - Approach on addressing SRM-22-0076 requirements in Non-LWR digital I&C designs addressed in Workshop 3 on March 14, 2024
- Pre-Application Engagements
  - Long Mott CP (XE-100) readiness assessment
  - Clinch River CP readiness assessment
  - Holtec SMR-300 I&C Design

NRC DI&C Activities

Regulatory Infrastructure Modernization

- Policy and Rulemaking
- Guidance Development
  - Industry Guidance
  - Staff Guidance
- Generic Comms.

Licensing and Topical Reports

- Operating Reactor Modernization
  - DI&C LARs
- New and Advanced Reactor Licensing
  - SMRs
  - Non-LWRs
- Topical Reports

Research

- I&C Guidance Modernization
- New Technologies for Nuclear I&C Applications

I&C Guidance Modernization Research

	RARs from NRR to support performance-based approaches and reduce time, cost and uncertainty			
	Hazard Analysis	**Model-Based Systems Engineering (MBSE)**	**Safety Assurance Case (SAC)**	**Systems Engineering**
Goal	Build capability to evaluate a systems theoretic process analysis (STPA)-informed submittals (e.g., NEI 20-07)	Admit analytical evidence from earlier stages of development, reducing assurance time, cost, and uncertainty	Enable organizing different kinds of evidence & their logical integration to demonstrate safety	Enable interdisciplinary best practices in regulatory reviews
Status	Nearing completion	In contract solicitation – late stage	In execution – via contract	In contract solicitation – early stage
Outcome	Inform review efforts (e.g., NEI 20-07), advanced reactor applications, and future applications that reference these methodologies			

New Technologies for Nuclear I&C Applications

Wireless Technology Research for Nuclear Power Plants

- RAR-NRR-2021-014 and RAR-NRR-2024-014
- Why: to consider advances in wireless communication technologies, continued and potential expanded use of such technologies at NPPs, and protective measures for safety-related systems.
- RAR-NRR-2021-014 (Complete)
  - The NRC staff, with the assistance of Oak Ridge National Laboratory, undertook an effort to research potential impacts from the expanded use of wireless technologies. The NRC staff concluded that current regulatory guidance concerning the stand-off distance determination process does not need to be changed and will continue to ensure safety even with new modern wireless modalities.
  - Results:
    - Criteria for Determining the Safety of Wireless Technologies at Nuclear Power Plants (TLR-RES-DE-2023-006).
    - Determining the Safety of Wireless Technologies at Nuclear Power Plants (TLR-RES-DE-2023-007).

New Technologies for Nuclear I&C Applications

Wireless Technology Research for Nuclear Power Plants

- RAR-NRR-2021-014 and RAR-NRR-2024-014
- Why: to consider advances in wireless communication technologies, continued and potential expanded use of such technologies at NPPs, and protective measures for safety-related systems.
- RAR-NRR-2024-014 (In Progress)
  - Research is focused on developing and identifying foundational information for wireless applications in NPPs, supporting a technical basis for application of these technologies in monitoring and other uses, from a reliability perspective.
  - The research will document existing information, including current and planned consensus standards, in a technology agnostic manner, and potential criteria useful for reviewing and qualifying the potential expanded use of wireless technology.

NRC Coordination Efforts

- Domestic Engagements
  - Workshops on Instrumentation and Controls for Advanced Reactors
  - Workshops on DI&C Modernization Licensing Lessons Learned
  - Participation in consensus organizations (e.g., IEEE Nuclear Power Energy Committee)
  - Engagements with Department of Energy
  - Engagements with Electric Power Research Institute

- International Engagements
  - Periodic technical exchanges with other regulatory authorities
  - Participation during international consensus organizations (e.g., IAEA, IEC)

Closing Remarks

Acronym List

ACRS – Advisory Committee for Reactor Safeguards
ALS – Advanced Logic System
ALSv2 – Advanced Logic System Version 2
ARCAP – Advanced Reactor Content of Application Project
ARP – Alternate Review Process
BTP – Branch Technical Position
CCF – Common Cause Failure
CFR – Code of Federal Regulations
CP – Construction Permit
DI&C – Digital Instrumentation and Controls
DRG – Design Review Guide
ECCS – Emergency Core Cooling System
IEC – International Electrotechnical Commission
FAT – Factory Acceptance Test
FPGA – Field Programmable Gate Array
FPL – Florida Power and Light
IAEA – International Atomic Energy Agency
IBR – Incorporation by Reference
IEEE – Institute of Electrical and Electronics Engineers
I&C – Instrumentation and Controls
ISG – Interim Staff Guidance
LAR – License Amendment Request
LWR – Light Water Reactors
MBSE – Model-Based Systems Engineering
NEI – Nuclear Energy Institute
NIST – National Institute of Standards and Technology
Non-LWR – Non-Light Water Reactor
Non-LWR – Non-Light Water Reactor
NPUF – Non-power Production or Utilization Facility
NRC – Nuclear Regulatory Commission
PR – Periodic Review
RAR – Research Assistance Request
RG – Regulatory Guide
RIS – Regulatory Issue Summary
RTR – Research and Test Reactor
SAC – Safety Assurance Case
SAT – Site Acceptance Test
SDA – Standard Design Approval
SE – Safety Evaluation
SECY – Official Communication with the Commission
SIL – Safety Integrity Level
SMRs – Small Modular Reactors
SRM – Staff Requirements Memorandum Issued by the Commission
SRP – Standard Review Plan
STPA – Systems Theoretic Process Analysis
TICAP – Technology-Inclusive Content of Application Project
TLR – Technical Letter Report
TR – Topical Report