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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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DIGITAL INSTRUMENTATION AND CONTROLS SUBCOMMITTEE

+ + + + +

TUESDAY

JUNE 2, 2020

+ + + + +

The Subcommittee met via Video
Teleconference, at 2:00 p.m. EDT, Charles Brown,
Chairman, presiding.

COMMITTEE MEMBERS:

CHARLES H. BROWN, JR. Member

RONALD G. BALLINGER, Member

DENNIS BLEY, Member

VESNA B. DIMITRIJEVIC, Member

WALTER L. KIRCHNER, Member

JOSE MARCH-LEUBA, Member

DAVID A. PETTI, Member

JOY L. REMPE, Member

PETER RICCARDELLA, Member

MATTHEW W. SUNSERI, Member

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ACRS CONSULTANT:

MYRON HECHT

DESIGNATED FEDERAL OFFICIAL:

CHRISTINA ANTONESCU

ALSO PRESENT:

JOE ASHCRAFT, NRR

LARRY BURKHART, NRR

JORDAN HOELLMAN, NRR

SCOTT MOORE, ACRS

JOHN SEGALA, NRR

DINESH TANEJA, NRR

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P R O C E E D I N G S

2:03 p.m.

CHAIR BROWN: I will call the meeting to order. This is a meeting of the Digital Instrumentation and Controls Subcommittee. I am Charles Brown, Chairman of the subcommittee.

ACRS members in attendance are Dennis Bley, Matt Sunseri, Jose March-Leuba, Vesna Dimitrijevic, Joy Rempe, Walt Kirchner, Dave Petti, Myron Hecht, our consultant, and I don't think I left -- oh, Vesna -- no, I got Vesna. I don't think I left anybody out.

If I did, would you please tell me?

MEMBER BALLINGER: This is Ron.

CHAIR BROWN: Ron, I left you out. Sorry for that.

MEMBER BALLINGER: I've been left out by professionals.

CHAIR BROWN: Oh, come on. Give me a break.

Christina Antonescu, of the ACRS staff, is the designated federal official for this meeting. The purpose of this meeting is for the staff to brief the subcommittee on draft Design Review Guide: Instrumentation and Controls for Non-Light-Water

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1 Reactors.

2 Specifically, the focus will be on the
3 five fundamental principles that the Committee has
4 emphasized as the framework for the new DRG.

5 As such, the staff should discuss how they
6 have addressed each principle and how the review
7 process will ensure that each principle is met in the
8 design.

9 Today, we have members of the NRC staff to
10 brief the subcommittee. The ACRS was established by
11 statute and is governed by the Federal Advisory
12 Committee Act, FACA.

13 That means the committee can only speak
14 through its published letter reports. We hold
15 meetings to gather information to support our
16 deliberations. Interested parties who wish to provide
17 comments can contact our office requesting time.

18 That said, we've set aside ten minutes for
19 comments from members of the public attending or
20 listening to our meeting. Written comments are also
21 welcome.

22 The meeting agenda for today's meeting was
23 published on NRC's public meeting notice website as
24 well as the ACRS meeting website.

25 On the agenda for this meeting, and on the

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1 ACRS meeting website, are instructions as to how the
2 public may participate. No request for statements to
3 the subcommittee have been received from the public.

4 Due to COVID-19 we are conducting today's
5 meeting virtually. A transcript of the meeting is
6 being kept and will be made available on our website.

7 Therefore, we request that participants in
8 this meeting should first identify themselves and
9 speak with sufficient clarity and volume so that they
10 can be readily heard.

11 All presenters, please pause from time to
12 time during your presentation to allow members to ask
13 questions. Please also indicate the slide number you
14 are on when moving on to the next slide.

15 We have a bridge line established for the
16 public to listen to the meeting. The public line will
17 be kept in a listen-only mode until the time for
18 public comment.

19 To avoid audio interference, I request all
20 attendees to make sure that they are muted while not
21 speaking.

22 Based on our experience from previous
23 virtual meetings, I would like to remind the speakers
24 and presenters to speak slowly.

25 We will take a short break after -- we

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1 only have one presentation today; don't we, Christina?

2 MS. ANTONESCU: Yes, we only have one
3 presentation.

4 CHAIR BROWN: Okay. We do have a backup
5 phone call -- call-in number should Skype go down, and
6 it has been provided to the ACRS members. If we need
7 to go to the backup number, the public line will also
8 be connected to the backup line.

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

14 Note that we have scheduled an advisory
15 committee full committee review of this Design Review
16 Guide for September 2020 based on the outcome of this
17 Digital I&C Subcommittee meeting.

18 We will now proceed with the meeting and
19 I will ask Mr. Jordan Hoellman to share his screen
20 with us while John Segala, the branch chief of the
21 Advanced Reactor Policy Branch in the Division of
22 Advanced Reactors and Non-Power Production and
23 Utilization Facilities in the Office of Nuclear
24 Reactor Regulation, provides any -- to provide
25 introductory comments or remarks before we start

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1 today's meeting.

2 I think that concludes it. Would you --
3 John, would you like to make some comments? I didn't
4 check to see that you were here. So, I presume you
5 are.

6 MR. SEGALA: I am. Can you hear me?

7 CHAIR BROWN: Yes. I can hear you fine.
8 Thank you.

9 MR. SEGALA: Okay. Thank you and good
10 afternoon.

11 Again, my name is John Segala. The
12 purpose of today's briefing is to provide the members
13 an informational overview of the Design Review Guide
14 for Instrumentation and Controls for Non-Light-Water
15 Reactor Reviews.

16 The presentation will provide a history of
17 the development of the draft guide. I wanted to take
18 this opportunity, at the beginning of the meeting, to
19 place this effort in context with the staff's broader
20 efforts to develop advanced reactor guidance.

21 The development of the instrumentation and
22 control guidance was started to identify and apply
23 insights and lessons learned from past new reactor
24 application reviews that are important to be captured
25 and addressed in order for the Agency to be ready for

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1 future, new or advanced reactor licensing
2 applications.

3 The draft review guide, for the most part,
4 was developed separately from the Licensing
5 Modernization Project as outlined in the recently
6 approved SECY paper, SECY-19-0117, and before the
7 recent start of activities associated with the
8 industry-led Technology Inclusive Content of
9 Application Project, or TICAP, and the staff-led
10 Advanced Reactor Content of Application Project, or
11 ARCAP, which will provide guidance for risk-informing
12 the scope and level of detail of a licensed
13 application.

14 Both TICAP and ARCAP are based on the
15 Licensing Modernization Project. The staff plans to
16 brief the ACRS on TICAP and ARCAP efforts next
17 calendar year.

18 More recently, as the instrumentation and
19 control draft guidance was further developed, it
20 incorporated concepts from the Licensing Modernization
21 Project.

22 The staff does not currently believe such
23 guidance will necessarily be needed for every portion
24 of an advanced reactor application.

25 The staff envisions that the TICAP and

1 ARCAP efforts will provide sufficient guidance for
2 advanced reactor applications such that draft guidance
3 for every portion of an application will likely not be
4 needed.

5 The staff does not plan to incorporate
6 this specific I&C guidance into its overall guidance
7 on application content, but will continue to ensure
8 that the draft review guide remains aligned with the
9 TICAP and ARCAP efforts.

10 The staff does believe that the draft
11 guidance for instrumentation and control provides an
12 important example of how a review can be performed
13 using concepts from the Licensing Modernization
14 Project.

15 We are looking forward to hearing from the
16 ACRS on this important topic today and any insights
17 and feedback that you all may have.

18 Although the NRC is not asking for ACRS to
19 write a letter, we understand that ACRS may be
20 planning to write us a letter.

21 And if ACRS writes us a letter following
22 the full committee, the NRC will finalize the draft
23 review guide -- we address any issues identified by
24 the ACRS.

25 At this point, I'd like to turn the

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1 meeting over to Jordan Hoellman to begin the
2 presentation.

3 MR. HOELLMAN: Thank you, John.

4 Can everyone hear me okay?

5 CHAIR BROWN: Yeah. I have a question
6 before you -- I just lost you. There you are again.

7 Would you say what TICAP and ARCAP again
8 -- are again? That's the first I've heard those -- or
9 the first I remember hearing them.

10 MR. SEGALA: Well, these are -- the TICAP
11 project is a Southern-led, DOE-funded -- or cost-
12 shared project NEI coordinated that basically takes
13 the output of the Licensing Modernization Project,
14 which I -- is used to identify the events, classify
15 the system structures and components and ensure
16 defense-in-depth.

17 And so, they'll take that output and then
18 it's developing a methodology that developers could
19 use to help document the safety case and the
20 application and you'll end up having more information
21 in the application for the SSCs that are safety-
22 related and risk significant with special treatment
23 than you will for system structures and components
24 that are truly just non-safety-related.

25 The TICAP project that industry's leading

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1 only focuses on the content of an application that's
2 directly tied to the Licensing Modernization Project.
3 So, that would be historical chapters 4, 5, 6, Chapter
4 15, Chapter 19, chapters like that.

5 So, the staff felt like we needed to
6 provide some guidance or methodology for how to fill
7 out and risk-inform performance-based -- develop the
8 rest of the application, the rad waste, different
9 parts of the application that aren't directly tied to
10 the Licensing Modernization Project.

11 So, we're at the early stages of these two
12 projects. We have some public meetings set up on the
13 11th and 12th to continue the dialogue on these
14 projects.

15 And we do plan to come in front of the
16 ACRS, but these are really -- sort of could be thought
17 about, you know, a second phase after the Licensing
18 Modernization Project to be able to use this to risk-
19 inform the application.

20 CHAIR BROWN: Okay. Second question was,
21 if I understood you in your earlier dialogue, that
22 this is a document that's been developed to disappear?
23 It's not going to be incorporated or -- that's the
24 flavor I got from your comment and I've never
25 envisioned this document to disappear.

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1 Fact is, it's a springboard from -- all
2 the applications, the last four design -- new design
3 applications we've used this format of architectures
4 for every one of the I&C reviews in the light-water
5 world and -- including at least one commercial plant.

6 MR. SEGALA: So, I don't see it
7 disappearing. I just -- I wanted to make it clear
8 that as we move forward with TICAP and ARCAP, that
9 we're not going down the path of developing a similar
10 document for every chapter of the old SRP -- the
11 light-water reactor SRP. That we're developing more
12 of a methodology that developers could use to assemble
13 their application.

14 And this document, we think, is a good
15 document. It's heading -- it is a technology-
16 inclusive, risk-informed, performance-based guidance
17 document that the staff can use for non-light-water
18 reactors, but it could also be used for light-water
19 SMRs as we move forward.

20 So, I don't see this going away. I just
21 wanted to make sure that the ACRS didn't leave this
22 meeting thinking that we're going to develop 19 more
23 of these documents, because that's not what our plan
24 is. There are -- are four non-light-water reactors.

25 CHAIR BROWN: Yeah that's -- okay. I got

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1 that.

2 MR. SEGALA: There is a whole other effort
3 that's undergoing -- they're looking at on the light-
4 water side of modernizing the SRP.

5 So, I just wanted you to understand that
6 there's kind of two different activities going on,
7 what we're doing for the non-light-water reactor world
8 and what's going on in the light-water reactor world.

9 CHAIR BROWN: Well, this is really a child
10 of the design-specific review standards that we've
11 developed -- or that the staff developed for --

12 MR. SEGALA: NuScale.

13 CHAIR BROWN: NuScale -- well, as well as
14 mPower.

15 MR. SEGALA: Yep.

16 CHAIR BROWN: And the idea -- those are
17 light-water reactors -- or at least right now they are
18 -- and I wasn't asking really whether you were going
19 to rewrite all of the standard review plan chapters.

20 That was not -- I didn't ask my question
21 correctly, but this is a -- between the DSRSEs
22 evolving into this particular version for the non-
23 light-water reactor that's an attempt to kind of
24 reorient the whole method of reviewing and what you
25 assess and how you approach the digital I&C world for

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1 any new plants whether they be, in this case, non-
2 light-water reactors, advanced reactors.

3 And, I guess, my view as part of the
4 committee -- I haven't told the committee this yet.
5 Maybe they've probably figured it out -- that this
6 approach -- this document that you-all have prepared,
7 based on my review of it, reading all scrumptious
8 number of pages, is that it positions itself quite
9 nicely to be translated -- take off the "non" in each
10 of the -- the straight title and in the parentheses,
11 and you have just about the methodology that the
12 committee has been using for evaluating those designs
13 and for our particular purposes, but with a lot more
14 detail for your-all's purposes.

15 So, I just didn't want to see this thing
16 all of a sudden be viewed as, well, this is a fine
17 operation, so there's limited application, because I
18 personally don't view it that way. And maybe that's
19 a good reason to write a letter.

20 MR. SEGALA: Yeah. Well, I think I would
21 say that I agree with everything you said. I think
22 when you go down the path of the staff and you develop
23 something that's technology-inclusive, you know, by
24 definition, it could be applied to more than one
25 technology.

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1 And so, having this be the next evolution
2 of the I&C DSRS and, you know, building it so that it
3 could work with the Licensing Modernization Project,
4 you know, we think this is a good document that will
5 help us be risk informed and focus on the most
6 important aspects of the I&C design so that we should
7 be focusing our attention on those things that are the
8 most important. And I think this draft review guide
9 does that.

10 CHAIR BROWN: Okay. That was -- I just
11 wanted to make sure I understood because the DSRSes
12 for mPower and NuScale's were -- they were technology-
13 neutral and risk-informed as well, if you go read
14 them. They were not descriptive -- or proscriptive by
15 any stretch of the imagination. So, this merged
16 nicely from those review guides quite -- as the way I
17 view it anyway.

18 All right. Go ahead. I'm sorry. I just
19 had to get my two cents' worth in.

20 MR. HOELLMAN: Okay. This is Jordan
21 Hoellman.

22 Is everyone able to hear me okay?

23 CHAIR BROWN: I got you. Thank you, John
24 -- or Jordan.

25 MR. HOELLMAN: Okay. All right. So, I'm

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1 going to move to the next slide. So, my name is
2 Jordan Hoellman. I'm a project manager in John's
3 branch, the Advanced Reactor Policy Branch in NRR.

4 So, the I&C DRG provides guidance for the
5 NRC staff to use in reviewing the I&C portions of
6 applications for advanced non-LWRs within the bounds
7 of existing regulations.

8 This guidance leverages the NuScale DSRS
9 Chapter 7 framework while factoring in lessons learned
10 from past new reactor reviews.

11 This guidance supports the NRC's advanced
12 reactor vision strategy near-term Implementation
13 Action Plans, or IAPs.

14 Specifically, the guidance supports IAP
15 Strategy 3, which involves developing guidance for
16 flexible regulatory review processes for non-LWRs
17 within the bounds of existing regulations, and
18 developing a new non-LWR regulatory framework that is
19 risk-informed and performance-based and that features
20 staff's review efforts commensurate with the
21 demonstration and safety performance of non-LWR
22 technologies.

23 So, I'm going to be discussing an overview
24 of how this fits in with LMP and the core review team
25 approach described in our annual status SECY papers on

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1 the advanced reactor program and sort of how we got
2 from SRP to DRG.

3 And then Joe Ashcraft will be discussing
4 the overview of the DRG and the review framework and
5 staff review approach.

6 So, I'm moving to slide 3. The NRC has
7 engaged with the Licensing Modernization Project, or
8 LMP, led by Southern Company, coordinated by NEI and
9 cost-shared by DOE.

10 The LMP's objective is to develop
11 technology-inclusive, risk-informed and performance-
12 based regulatory guidance for licensing non-LWRs for
13 the NRC's consideration and possible endorsement.

14 The LMP document, or NEI 18-04, outlines
15 an approach for use by reactor developers to select
16 licensing basis events, classify structure systems and
17 components, or SSCs, determine special treatment and
18 programmatic controls and assess adequacy of the
19 design in terms of providing layers of defense-in-
20 depth.

21 The NRC published draft Regulatory Guide
22 DG-1353, which endorses, with clarifications, the
23 principles and methodology in the LMP document, NEI
24 18-04, as one acceptable method for determining the
25 appropriate scope and level of detail for parts of an

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1 application for licenses, certifications and approvals
2 for non-LWRs.

3 The methodology described in NEI 18-04 and
4 the draft reg guide also provide a general methodology
5 for identifying an appropriate scope and depth of
6 information to be provided in applications to the NRC.

7 The staff issued SECY-19-0117, technology-
8 inclusive, risk-informed and performance-based
9 methodology, to inform the licensing basis and content
10 of applications for licenses, certifications and
11 approvals for non-light-water reactors.

12 On December 2nd, 2019, as John mentioned
13 last week on May 26th, the Commission approved the use
14 of the methodology described in this paper as a
15 reasonable approach for establishing key parts of the
16 licensing basis and content of applications for
17 licenses, certifications and approvals for non-light-
18 water reactors.

19 The DRG for I&C reviews has been
20 coordinated to align with the risk-informed,
21 performance-based LMP framework and provides review
22 guidance on all aspects of safety-significant I&C
23 systems, which includes safety-related I&C systems and
24 I&C systems that are not safety-related, but warrant
25 special treatment.

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1 Although the DRG aligns with the LMP
2 framework, the DRG provides the flexibility for staff
3 to perform I&C reviews for applications that do not
4 implement the LMP framework as well.

5 So, I'm moving on to slide number 4. So,
6 in the staff annual commission paper on the status of
7 advanced reactor program, the staff informed the
8 Commission that it uses the core review team approach
9 to conduct effective non-LWR pre-application reviews.

10 The core review team comprises
11 specifically assigned staff members across a range of
12 technical disciplines.

13 Using a core review team approach, the I&C
14 review will be conducted as part of the staff's
15 collaborations on the overall plant design and
16 associated programmatic controls.

17 This DRG may be used for a more focused
18 review of specific I&C areas identified by the core
19 review team.

20 So, I'm moving on to --

21 CHAIR BROWN: Don't move on yet.

22 MR. HOELLMAN: I'm moving back to slide 4.

23 CHAIR BROWN: What do you mean, "may be
24 used"? You said something they may consider or it may
25 be used for their focus review.

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1 MR. HOELLMAN: So, using the core review
2 team approach, the idea is based on the safety-related
3 and safety-significant SSCs in a specific design, the
4 staff will, you know, form this multidisciplinary core
5 review team to review the application.

6 For an application where the I&C -- the
7 digital I&C SSCs are safety-related and safety-
8 significant, the staff expects will need a more
9 focused review of the I&C areas.

10 For an application that the I&C SSCs are
11 not safety-related and don't have special treatment,
12 the core review team may reach out to the I&C staff to
13 perform a more detailed review.

14 Does that make sense?

15 CHAIR BROWN: Yeah. The last -- I lost the
16 bubble.

17 MR. HOELLMAN: So --

18 CHAIR BROWN: So, where it's not -- where
19 the I&C is not deemed safety-related, they may reach
20 out and have them do a review.

21 I just -- what this sounds -- if I want to
22 phrase this in my own terminology, is that if we
23 determine that the reactor is so safe that we don't
24 need any I&C, we won't bother doing a review, we'll
25 just let the vendor do what he wants.

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1 Did I say that kind of right without all
2 the other --

3 MR. HOELLMAN: So, I think what -- I think
4 maybe what I was trying to say, or could have said
5 better, is that the I&C -- we may not have to use the
6 entire DRG to make a reasonable assurance finding on
7 the I&C SSCs of a specific design.

8 Does that make sense?

9 CHAIR BROWN: No.

10 MR. HOELLMAN: So --

11 MR. SEGALA: This is John Segala. I don't
12 know if this is a better way to say it, but, you know,
13 when you go through, let's say, the Licensing
14 Modernization Project and you're going to demonstrate
15 how you, you know, perform the fundamental safety
16 functions of control, reactivity, remove decay heat,
17 retain radionuclides, you know, if a particular design
18 can demonstrate that they can perform all those
19 activities with inherent safety such that they don't
20 need to rely on any electric power or I&C to perform
21 their -- all their safety functions and assure public
22 health and safety, then the level of review needed for
23 that design, all the I&C SSCs would be non-safety with
24 no special treatment. So, there would be a smaller
25 review done of the I&C.

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1 So, you would not need the full-scale
2 review of the DRG because most of that focuses on the
3 safety-related SSC -- I&C SSCs as well as the I&C SSCs
4 that are important -- that are safety-significant and
5 have special treatment.

6 So, in the risk-informed review, we're
7 going to be focusing our attention on those SSCs that
8 are safety-related and, by definition, would be risk-
9 significant as well as those SSCs that are non-safety-
10 related, but needed for -- that have special treatment
11 because they have risk significance or are needed for
12 defense-in-depth.

13 CHAIR BROWN: Okay. I hear you.

14 MEMBER BLEY: John, this is Dennis Bley.
15 Can we look back at Jordan's slide number 3?

16 As we begin to switch toward really trying
17 this LMP process, there's one thing I want to know how
18 the staff is thinking about it.

19 The lower left corner of that flow chart
20 has non-safety-related SSCs with no special treatment
21 and you get there if you're not risk significant.

22 However, if you did your risk assessment
23 using data especially for failure rates and
24 nonavailabilities based on the existing plants where
25 there is special treatment on those items or they show

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1 up in the tech specs, if we suddenly don't have those
2 requirements, both the reliability may go down and the
3 availability may also go way down.

4 How do you make sure we don't slip into
5 that condition?

6 (Pause.)

7 MR. SEGALA: Sorry, I think I had it on
8 mute there.

9 You know, I think as they go through and
10 they do LMP and they're going to look at the
11 reliability of the SSCs and to the extent they can
12 base that on existing data, they'll do that.

13 They're going to do -- they're going to
14 look at the uncertainties, they're going to be
15 plotting the means and the uncertainties of all the
16 points and they're going to plot that on the curve.

17 And then they're going to establish
18 performance criteria and treatment to make sure that
19 they stay within those bounds for those SSCs and
20 they're going to follow the non-light-water reactor
21 PRA standard.

22 As they are doing their -- the PRA and
23 putting the numbers in, they're going to do a peer
24 review of that, which -- and then the staff is going
25 to do a review of that as well.

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1 So, I don't know if that answers your
2 question, but that's the general approach.

3 MR. ASHCRAFT: This is Joe Ashcraft from
4 I&C. I think we're going to address this a little bit
5 more in Slides 8 and 9.

6 MEMBER BLEY: I'll look forward to that,
7 but I -- you guys need to really think about this one.
8 There are more ways to deal with this and we'll be
9 watching, as the LMP kind of moves forward, looking
10 for this sort of thing.

11 But just looking at the current
12 uncertainties isn't enough because you're suddenly
13 changing the regime under which this equipment will
14 operate and you could have very different performance.

15 You could go back to where we were 30
16 years ago when, if you had three items and only two
17 were covered by tech specs, the third generally sat in
18 pieces on the floor. So, it wasn't there if you
19 needed it. So, you got to think about that.

20 Go ahead.

21 MR. HOELLMAN: Okay. Thank you.

22 This is Jordan Hoellman again, I guess.
23 Are there further questions on this or can I move on
24 to slide number 5?

25 CHAIR BROWN: Just hold on a second. I'm

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1 -- we can move on, but I just want to make -- the way
2 I'm going to be looking at the rest of these -- the
3 slides in the discussion is all of this is a
4 precursor.

5 This is based on this -- the lofty desire
6 of the super safe reactor -- the advanced reactor and
7 this is kind of a game plan and overarching strategy.

8 And this particular focus that you're
9 talking about -- I'm trying to answer my own question
10 a minute ago -- is that if we achieve that, that's
11 just fine.

12 If we don't, we have a document that
13 provides us a methodology for doing the focused review
14 of the safety functions required.

15 MR. SEGALA: This is John Segala. I agree
16 with what you just said.

17 CHAIR BROWN: Okay. We're listening to the
18 program -- the big-picture program, the lofty program
19 approach that says if all these aspirations come true,
20 that's fine.

21 But if they don't, in this area, we would
22 end up being able to have a standard that we could use
23 for determining the satisfactory nature of that
24 system.

25 MR. SEGALA: That's exactly correct.

1 CHAIR BROWN: Okay. So, I won't -- I won't
2 opine anymore on the lofty fame plan here.

3 MR. ASHCRAFT: Yeah. Charlie, this is Joe
4 Ashcraft. I think that's where we get into slide --
5 starting at slide 8, I think, what you're looking for.

6 CHAIR BROWN: Yeah. I took a quick look as
7 Dennis was talking. So, we can move on through this
8 and then we'll get on into what the review guide says.
9 Okay? Thank you.

10 MR. HOELLMAN: Okay. Thanks, Charlie.
11 I'll move to slide 5.

12 So, building on past challenges associated
13 with I&C reviews and the shortcomings of the Standard
14 Review Plan as applied to the new reactor licensing,
15 the I&C DRG was initiated as a proactive way to
16 modernize the I&C safety review of advanced non-LWR
17 applications by providing guidance for technology-
18 inclusive, risk-informed and performance-based
19 reviews.

20 As demonstrated by the experience with the
21 NuScale DSRS I&C review, the staff believes that the
22 DRG guidance will lead to more efficient and effective
23 reviews.

24 Most recently, the DRG has been revised to
25 align with the terminology and framework described in

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1 LMP.

2 And it should be noted that while the DRG
3 aligns with the LMP framework, it additionally
4 provides flexibility for the staff to perform I&C
5 reviews of applications that don't implement the LMP
6 framework.

7 Going forward, the staff will continue to
8 ensure that the DRG aligns with the industry-led
9 TICAP, the NRC-led ARCAP project, and other advanced
10 reactor initiatives including the future Part 53
11 regulatory framework.

12 The DRG was published in the Federal
13 Register for public comment on April 14th, and the
14 comment period ends on June 29th, 2020.

15 CHAIR BROWN: Go ahead. I'll let you
16 finish before I interrupt again.

17 MR. HOELLMAN: Okay. If you want to
18 interrupt, that's fine, too.

19 CHAIR BROWN: Okay. Go back to slide 5
20 then.

21 MR. HOELLMAN: Okay.

22 CHAIR BROWN: I just didn't want to get
23 ahead on the words. When you say you modeled after
24 the DSRS for NuScale, that whole DSRS and that whole
25 review process has been about a 12-year evolution

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1 since -- based on architectures, frameworks,
2 independence, redundancy, et cetera, et cetera.

3 And if you looked at how the NuScale
4 review went, it slid through -- it was so smooth as to
5 be unbelievable.

6 There was only one minor glitch that we
7 had to deal with, which NuScale properly recognized
8 the goodness of our suggestions and we were able to
9 easily slide it through.

10 It just took almost no time at all to do
11 that review because all the information that was
12 embodied in the DSRS was provided in terms of the
13 block diagrams, the interrelations, communications.
14 The whole schmear was crafted and mixed together quite
15 well.

16 So, I see you all have reworded a lot and
17 generalized a lot as you went from the DSRS to the
18 review guide. I think you said that. You said, in
19 the LMP view.

20 So, I -- there's a few things I will
21 probably make comments on, but it is -- we really
22 don't want to lose the DSRS thought process either
23 because that does apply quite well without mangling it
24 with the new thought processes that are involved.

25 So, the NuScale approach worked

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1 beautifully. And the fact is that same approach was
2 used on APR-1400, even though they didn't have a DSRS,
3 and it went smooth as silk also. Just a very timely
4 review on both of them with almost no issues.

5 So, that's why I like the review guide.
6 So, I hope -- I'm just not sure with some of the stuff
7 that's been left out, that it will be as smooth as --
8 there's some assumptions made that I don't think are
9 realistic even for your technology-neutral stuff.

10 So -- but I'll try to bring those up as we
11 go. So, you can go on to slide -- what is it? 6?
12 Slide 6 now.

13 MR. HOELLMAN: All righty. Moving on to
14 slide 6. So, this is just a slide that walks through
15 the evolution of I&C review guidance.

16 The SRP is the primary staff guidance and
17 the use of the 2007 version has been effective for LWR
18 reviews, but, due to its nature, the use of the SRP
19 for new reactor reviews has not always been optimized
20 in the past.

21 The staff wanted to improve how we did I&C
22 reviews for SMRs, or small modular reactors, by
23 removing requirements that no longer apply to the SMRs
24 and removing duplicative reviews of the same
25 requirement as many requirements were reviewed in each

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1 of the seven sections in the SRP.

2 CHAIR BROWN: Okay. Let me make a comment
3 before you go on.

4 MR. HOELLMAN: Sure.

5 CHAIR BROWN: You said the SRP's 2007.

6 That 2007 SRP was being applied to one of
7 the first projects when I first got here. It was an
8 absolute disaster trying to figure out what they were
9 going to do. It was like the staff had no choice.

10 The vendor came in and said, here's a one-
11 line diagram. It was nothing but a one-line diagram
12 and a few boxes.

13 And they said they would meet all the spec
14 requirements, IEEE reg guides, rules, and that was it.
15 They dusted their hands and said, we're done.

16 And the Committee put an all-staff on that
17 and insisted that an architecture be developed that
18 showed what they had in mind. It took two years to
19 finish that.

20 The same thing was applied, then, to one
21 -- the AP-1000. So, that's a little history that's
22 behind this.

23 This did not just flow from nothing. The
24 old SRP did not take an architecture-based review
25 approach to reviewing digital I&C -- I&C systems for

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1 any plant. That was simply developed as a fallout of
2 the early new designs that were coming up around 2008.

3 So, I just wanted to provide that as a
4 historical comment. So, it's not like this just
5 magically appeared as a DSRS.

6 It flowed from ESBWR, and then into AP-
7 1000, and then it was recognized that it would be very
8 useful if that architecture approaching review -- you
9 still had the SRP stuff and you still had reg guides,
10 but the framework was put together with the five
11 principles, and the architecture is the main focal
12 point to springboarding into the overall review and
13 design.

14 So, that was -- it didn't just appear out
15 of the blue, is all I'm trying to tell you. So, I
16 hate to bore everybody with the details, but that's
17 important in terms of understanding how we got to
18 where we are today.

19 And that process, as we developed it, is
20 amenable. It's always been non-technology. It's
21 always been technology-neutral no matter what you do.

22 And it's always been amenable to a risk-
23 informed approach, if you so desire, and performance-
24 based. None of those were ever excluded in the first
25 couple -- as we applied this.

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1 So, anyway, the DSRS is the same way right
2 now for NuScale as well as for mPower. Just a little
3 bit more background.

4 Okay. Are we on slide 6? Are we finished
5 with that one -- no, I guess we're not. I interrupted
6 you. Sorry about that.

7 MR. HOELLMAN: No, that's okay, Charlie.
8 I certainly appreciate hearing all the background on
9 how we got to where we are especially, you know, from
10 your perspective. So, I appreciate that. Thanks.

11 MEMBER BLEY: Charlie, digging into the
12 background got me curious enough to bring up something
13 again I kind of forgot.

14 Some years ago Lynn Mrowca and a group she
15 worked with developed the Enhanced Safety-Focused
16 Review Process.

17 And I think that's identical to what you
18 showed on the previous slide and in an earlier one; is
19 that right? And it's on 6.

20 MR. HOELLMAN: Yes.

21 MEMBER BLEY: Okay. Thank you.

22 MR. HOELLMAN: Yes. Yes.

23 Okay. So, to continue on slide 6, the
24 Commission's policy on the review of SMRs expects that
25 the staff develops and uses DSRSes for each

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1 application for efficiency and effectiveness.

2 The NRC I&C staff took the opportunity to
3 develop the DSRS for I&C that is significantly
4 different from the SRP. So, I'm kind of discussing
5 what Charlie already brought up, but I'll continue.
6 The concept of one review and one set of requests for
7 additional information was used.

8 The DSRS reflects the four fundamental I&C
9 design principles plus one concept of simplicity by
10 adding sections for independence, redundancy,
11 predictability and repeatability and diversity and
12 defense-in-depth.

13 CHAIR BROWN: And you left out control of
14 access, which was actually the fifth principle. It's
15 a hard core principle. If you don't control access,
16 you don't have independence.

17 Do you understand my point?

18 MR. HOELLMAN: Yes.

19 CHAIR BROWN: You do have a Control of
20 Access Section in here.

21 MR. HOELLMAN: There is a Control of Access
22 Section as well, yes.

23 CHAIR BROWN: It's not very complete, but
24 I'll address that later, but that's a very, very
25 important issue.

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1 You cannot allow the design, particularly
2 in the digital age, to have unlimited access from
3 anyplace. It needs to be isolated.

4 So, I'll talk about that later, but it is
5 -- it's really five principles with control of access
6 being the fifth.

7 You can go on now.

8 MR. HOELLMAN: All right. Thanks, Charlie,
9 yeah. We have a slide on that coming up later.

10 CHAIR BROWN: Okay. Thank you.

11 MR. HOELLMAN: So, the two primary
12 objectives of the DSRS were to improve the safety
13 focus of the staff reviews by ensuring an applicant
14 has sufficient licensing basis details presented in
15 the application to clearly demonstrate that the
16 applicable regulations are met and fundamental I&C
17 design principles are addressed.

18 And the second objective was to improve
19 the efficiency of the reviews by limiting unnecessary
20 information from being documented reviewed and by
21 improving guidance to avoid unnecessary or repeated
22 requests for additional information.

23 As Charlie mentioned, the DSRS for NuScale
24 had been a huge success. Early availability of it
25 along with close pre-application coordination with the

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1 applicant was essential.

2 Unlike other previous new reactor
3 applications, the NuScale I&C review was completed
4 earlier than most other areas with no significant
5 challenges.

6 So, the -- now, we get to the DRG, which
7 is an evolution of the DSRS. It continues to reflect
8 the safety-focused approach from the DSRS, including
9 the fundamental I&C design principles, but was
10 developed while factoring feedback from lessons
11 learned initiative by the I&C staff from the NuScale
12 and APR-1400 reviews.

13 So, in the next slide we'll discuss the
14 goal for this document. So, I'm moving on to slide
15 7.

16 So, the DRG goal is to modernize the --

17 MEMBER REMPE: Jordan --

18 MR. HOELLMAN: Yes.

19 MEMBER REMPE: -- this is Joy. I
20 apologize for being a little slow to interrupt, but --

21 MR. HOELLMAN: That's fine.

22 MEMBER REMPE: -- at some point while I
23 was reading through this material, I was wondering
24 what are the most important lessons that you've
25 implemented and made some big changes where you hope

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1 to even make it better?

2 Generalization, that's not really a lesson
3 learned.

4 MR. HOELLMAN: So, maybe I'll let the I&C
5 folks tackle that one, if one of you guys want to
6 chime in.

7 MR. ASHCRAFT: Thanks, Jordan.

8 We sent you a couple of good examples and
9 I need to pull them up now, but -- this is Joe
10 Ashcraft.

11 MR. HOELLMAN: I thought you told me to
12 punt to you, though.

13 MR. ASHCRAFT: Okay.

14 MEMBER REMPE: I thought maybe you'd sent
15 me the examples and I was looking through it and I was
16 like, I don't think so. So, go ahead.

17 MR. ASHCRAFT: No. We established a
18 spreadsheet where we listed -- and I think we have 36-
19 some odd, you know, lessons learned that we tried to
20 factor at least some of them into the DRG and others
21 -- we're looking at other aspects of retaining them
22 and using them for the future.

23 MEMBER REMPE: Give me the highlights.
24 Don't go through all 36, please.

25 MR. ASHCRAFT: Yeah. Oh, man. I got to

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1 find that email. Dinesh, do you have any help here
2 while I look for this email if you want to start
3 discussing something?

4 (Pause.)

5 CHAIR BROWN: He's no help, Joe.

6 MR. ASHCRAFT: Yeah, I see that.

7 MR. HOELLMAN: Joe, I have the email you
8 sent me pulled up.

9 MR. ASHCRAFT: All right. Well, share that
10 then and we'll talk to it.

11 MR. HOELLMAN: Yeah. Okay.

12 So, what -- the list of examples you sent
13 me says that the DRG will be updated to explicitly
14 require applicants address the challenges associated
15 with the overall digital I&C architecture.

16 MR. ASHCRAFT: Yeah. Share that screen.
17 So -- yeah. So, one of the lessons learned we -- from
18 NuScale, I mean, that was an appendix to -- the DSRS
19 was our appendix for architecture, but we realized
20 during the NuScale review that -- and, as Charlie
21 states, looking at the architecture up front is, you
22 know, is like the start of knowing that it's going to
23 work or not.

24 So, that was one that we tried to
25 highlight more and bring it to the DRG more than just

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1 an appendix into the review aspect of the I&C.

2 And there was one more -- well, if you're
3 not going to share the screen, I guess you can go
4 ahead -- or maybe I'm not looking at the screen.

5 CHAIR BROWN: He shared some kind of
6 screen.

7 MR. HOELLMAN: I'm sharing the table you
8 sent me.

9 MR. ASHCRAFT: Okay.

10 MR. HOELLMAN: So, the two other issues are
11 the control of access, which Charlie already brought
12 up, and watchdog timer.

13 MR. ASHCRAFT: Item 16.

14 MR. HOELLMAN: Item 16 in this table here.

15 MR. ASHCRAFT: Right. So, although Charlie
16 has already said he has some comments, but those were
17 a couple of other areas where we tried to bring forth
18 what we learned in our other reviews into the DRG.

19 So -- and there's others. Like I say,
20 there's others, but these were two of the more
21 important ones, I think.

22 CHAIR BROWN: Yeah, you touched on this
23 one. I mean, you brought it up. It's just kind of
24 vague.

25 It's not -- you kind of left out words

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1 like "one-way hardware-based."

2 MR. ASHCRAFT: We'll get to that, Charlie.
3 I understand.

4 CHAIR BROWN: Okay. So, you know I'm hard
5 over on -- as you're well aware from the NuScale
6 review -- when they wanted the plant network to
7 communicate bidirectionally with the business unit and
8 we put the squash on that.

9 So -- if you recall that. Maybe -- I
10 guess you weren't on the NuScale thing, but that was -

11 MR. ASHCRAFT: Oh, yeah. Charlie, I've
12 been with the DSRS NuScale and all the way through the
13 DRG and there's others on the team. So, yeah, I was
14 aware of that and I was also on the APR-1400.

15 So, I know your concern quite well and I
16 feel we addressed it as best that we can, but, you
17 know, obviously there is words to be tweaked, if
18 needed.

19 CHAIR BROWN: Okay. I mean, you touched
20 all the stuff. I like the document, okay, as a
21 general -- you know, overarching.

22 It's just somehow the loss of control of
23 access tends to be more focused on the physical access
24 of somebody walking into the plant and going down to
25 the cabinets.

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1 MR. ASHCRAFT: Well, I think -- this is Joe
2 Ashcraft again.

3 I think in some of the questions in the
4 backup slides where that issue was raised, there's
5 areas in the DRG that specifically talk about the --
6 and I'll call it the one-way diode, not necessarily
7 hardware-based, but that connection that you're
8 referring to.

9 So, we did try to address that more in the
10 DRG than was in the DSRS in various sections.

11 CHAIR BROWN: Oh, yeah. That's plain.

12 MR. ASHCRAFT: So, you know, really I think
13 we've tried to address it without maybe using the word
14 "hardware," but let's go on. We'll get to that in
15 future slides, I'm sure.

16 CHAIR BROWN: Okay. All right. We're up
17 to slide 7 now. I forgot my question now. You found
18 out the secret to get me to shut up. You talked about
19 something else for a while and then all of a sudden
20 I've forgotten what I'm doing.

21 MR. ASHCRAFT: Yeah. That's why I'm a
22 presenter, Charlie.

23 CHAIR BROWN: Thank you very much, Joe.

24 All right. Go ahead.

25 MR. HOELLMAN: Okay. So, on slide 7 the

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1 DRG goal is to modernize I&C safety reviews in support
2 of advanced non-LWR licensing applications.

3 Success within this goal will be reflected
4 by a simpler streamlined and agile I&C review and
5 regulatory infrastructure that will effectively
6 address I&C designs for new and advanced non-LWR.

7 Based on public interactions at our
8 periodic advanced reactor stakeholder meetings, and
9 based on comments received on the DRG so far, and
10 based on the success of the DSRS use for the NuScale
11 review, there's early indication that the DRG achieves
12 this goal.

13 Making it available for non-LWR designers
14 early will help to establish predictable and efficient
15 I&C review processes while the common goal of safety
16 is ensured.

17 So, as I previously mentioned, the DRG
18 supports the NRC's vision and strategy for advanced
19 reactor safety reviews as it can be used by advanced
20 reactors with vastly different technologies. Also,
21 the DRG allows for a flexible review process within
22 the bounds of existing regulations.

23 So, the LMP review framework and
24 terminology of safety significance was factored into
25 the DRG.

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1 And just one last time although the DRG
2 aligns with the LMP framework, it is flexible to be
3 used for staff reviews for applications that do not
4 implement LMP.

5 CHAIR BROWN: What's Draft Reg Guide 1353?

6 MR. HOELLMAN: The Draft Reg Guide 1353 is
7 the reg guide -- you know, it's basically the reg
8 guide that endorses the use of LMP.

9 So, we developed the draft reg guide and
10 issued the SECY paper for the Commission. And, as I
11 mentioned, last week the Commission approved the use
12 of LMP. And so, now we're drafting the actual reg
13 guide.

14 CHAIR BROWN: Interesting.

15 MEMBER KIRCHNER: Jordan, this is Walt
16 Kirchner.

17 Charlie, may I ask a question?

18 CHAIR BROWN: Yeah, go ahead.

19 MEMBER KIRCHNER: It's more a statement
20 than question, I suppose.

21 This constant non-LWR emphasis, what if an
22 advanced LWR comes in? Would it be thrown back on the
23 old standard review plan or could it avail itself of
24 the DRG?

25 MR. HOELLMAN: So, I think if an applicant

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1 demonstrates that the -- just like LMP. So, the LMP
2 guidance documents have the non-LWR language in them
3 as well, but I think -- and someone can correct me if
4 I'm wrong, but I think our position is if an advanced
5 LWR application comes in and can demonstrate that it
6 can implement the LMP framework or fit within this
7 DRG, then it would be allowed to be used.

8 CHAIR BROWN: What if they didn't want to
9 use the LMP framework and they wanted to build a
10 light-water reactor?

11 Is somebody going to tell them not to?
12 They're not going to come in for an application if
13 they wanted to?

14 MR. HOELLMAN: Well, the LMP framework is,
15 you know, not -- not mandatory, I guess, you know.
16 It's an optional thing.

17 CHAIR BROWN: They could come in under a
18 Part 50 or 52, couldn't they?

19 MR. HOELLMAN: Yes. That's my
20 understanding. Right. And, as I mentioned, there's
21 multiple --

22 CHAIR BROWN: You could use this guide
23 under that guise also?

24 MR. HOELLMAN: Correct. Correct. I've
25 tried to emphasize that a few times in the

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1 presentation, but, yes, we believe that the DRG
2 provides the flexibility for the staff to perform I&C
3 reviews for applications that implement LMP and for
4 applications that do not implement LMP.

5 CHAIR BROWN: It's interesting to hear --
6 I always keep hearing all this technology-neutral
7 stuff.

8 If you go back, all the IEEE standards and
9 specs are all technology-neutral. None of them tell
10 you exactly what to use.

11 Doesn't matter what electronics you use,
12 microprocessors, computers, magnetic amplifiers, if
13 you really want to go back, vacuum tubes, even, you
14 can use that if you want to. They're all technology-
15 neutral. So, we're not inventing anything new with
16 technology-neutral.

17 And they've always been performance-based
18 because if they didn't operate and stay online,
19 they're not performance-based.

20 So, I mean, I just love the way we've
21 absconded words to try to advertise something, but
22 that's my particular shtick, you know.

23 MEMBER KIRCHNER: Charlie, if I could just
24 add, you know, functionality of the I&C system is
25 really the first order John said it well in his

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1 introductory remarks.

2 You've got these three principal functions
3 that you're trying to achieve, control of reactivity,
4 control of heat, control of release, however you
5 wanted to phrase those, and the I&C systems for those
6 functions are basically technology-neutral.

7 CHAIR BROWN: Exactly.

8 MEMBER KIRCHNER: I just -- I just -- this
9 constant non-LWR reference just kind of -- it almost
10 competes with the -- like, the first bullet and then
11 the boxes. It's just not consistent.

12 CHAIR BROWN: Okay. Well, here's the
13 strategy. Okay. They touch base with me. When did
14 you-all start this, Joe? This is a couple of -- three
15 years ago?

16 MR. ASHCRAFT: Yeah, I don't think it's
17 been three years, but, yeah, it's been a year or so.

18 CHAIR BROWN: Yeah, you know, it's been a
19 while, but whether it's non-LWR or LWR makes no
20 difference.

21 The point is we're developing a document
22 that focuses on the entire methodology that the
23 committee's been using now for the last 12 years for
24 us to come to a conclusion that the digital I&C
25 computer-based systems are satisfactory in their

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1 application to a reactor, period. Didn't make any
2 difference. To a reactor.

3 They've taken that and I don't care
4 whether they put the title "non" on it or not. We've
5 ended up now getting that entire strategy that we've
6 used for the last 12 years, okay, that was -- which
7 the staff developed from our first couple of --
8 decided to do the design-specific review standards
9 using that methodology that we used, you know, forced
10 ESBWR and AP-1000 to do and -- which was very
11 successful, you know. First, applied to mPower, then
12 it was used very well with the NuScale one. So, the
13 point being is I don't care what the label is in the
14 title.

15 We now have a document that literally is
16 universally applicable to light-water reactors just as
17 well as non-light-water reactors.

18 So, that's -- I haven't bothered poking at
19 the fact of the terminology and everybody talking
20 about non-LWRs.

21 It's because it achieved an end without having
22 to argue about the needs.

23 MR. ASHCRAFT: Yeah. This is Joe Ashcraft.

24 So, we started this process in 2018 and I
25 just wanted to say we did the impetus on non-light-

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1 water reactors in our presentation to build the DRG
2 just to meet or address the technical needs for this
3 area.

4 Now, we've realized in the past, talking
5 with Charlie and others, that it can be used
6 elsewhere, but that would -- you know, that's
7 something that we wanted to get this done and out and
8 that's the reason why it's strictly -- or the title is
9 for non-light-water for advanced reactors.

10 CHAIR BROWN: Yes. Is that a reasonable
11 enough answer, Walt?

12 MEMBER KIRCHNER: Yes. Actually, I agree
13 with what you're doing. I just find that non-LWR
14 moniker -- it just -- you're doing the right thing and
15 going forward, but there very well may be advanced
16 reactors coming in that are LWR derivative.

17 And one would hope one could avail oneself
18 of this principled functionality-based approach to
19 I&C. I'll get off the soapbox.

20 CHAIR BROWN: Okay. Thanks, Walt.

21 MR. HOELLMAN: Okay. This is Jordan again.

22 Certainly, yes, we understand that. And
23 as we work on the Part 53 optional regulatory
24 framework for advanced reactors, we understand that we
25 need to include advanced small modular reactors in

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1 that Part 53 as well. So, we're definitely aligned,
2 I think, with you on the use of non-LWR.

3 So, with that, I think I am through slide
4 8 and I will be turning it over to Joe Ashcraft to
5 discuss the I&C framework and the review approach
6 described in the DRG.

7 CHAIR BROWN: You didn't go to slide 8.
8 You only did slide 7.

9 MR. ASHCRAFT: Yeah. Thanks, Jordan. This
10 is Joe Ashcraft and we'll start with slide 8.

11 Before we start, though, I want to say
12 there's a list of abbreviations on slide 19. I know
13 we went through a lot in the first seven slides and we
14 probably are going to go through some more. So, if
15 that helps.

16 So, having said that, so if you look at
17 this slide, it's a top-down review approach. However,
18 this only depicts the flow of reviews should a full
19 I&C review be required.

20 So, the I&C reviewer would focus on
21 verifying the applicable attributes of the I&C system
22 design that supports the plant level performance
23 objectives as depicted in the figure.

24 So, if you look at the top two bubbles,
25 that's performed by the core review team that was

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1 discussed earlier with I&C support as necessary if
2 required.

3 And this review will formulate what, if
4 any, of the blue box area is needed to be reviewed by
5 the I&C staff.

6 So, if there's, you know -- well, that
7 said --

8 CHAIR BROWN: If there's a reactor that is
9 perfectly safe, you'll never get -- you'll never see
10 it.

11 MR. ASHCRAFT: Yeah. That's right.

12 So, if you look, the blue box area, that's
13 what the I&C staff will be reviewing. So, we're
14 looking for demonstration that the I&C performance
15 objectives have been met in the terms of -- on the
16 left side -- reliability of the I&C design, which is
17 the probability that a system or component will meet
18 its minimum performance requirements under all plant
19 conditions. Quantitative and qualitative performance
20 measures and criterias are used in support of this
21 portion of the assessment.

22 And on the right side, robustness of the
23 I&C design which is the degree to which a system or
24 component can function correctly in the presence of
25 invalid inputs or stressful environmental conditions.

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1 Defense-in-depth performance measures are
2 used in support of this portion of the assessment via
3 the fundamental I&C design principles from the DSRS,
4 which is incorporated into this DRG, as well as the
5 qualification measures such as quality.

6 CHAIR BROWN: Joe, how come you don't say
7 the fundamental principles of digital I&C and repeat
8 them in your defense-in-depth measures box?

9 It's devoid of the fundamental principles
10 verbiage anywhere in this, quote, I&C system
11 framework.

12 MR. ASHCRAFT: Well, it falls under the
13 defense-in measures -- measures. So, if you went into
14 the actual DRG, you would see the principles fold
15 under that one bubble that's under "Robustness" to the
16 left.

17 So, this is just sort of a very broad
18 overview of what the DRG encapsulates.

19 CHAIR BROWN: Yeah. The point is just that
20 it's getting people focused on the fundamentals.
21 That's all.

22 MR. ASHCRAFT: Okay. Understood.

23 CHAIR BROWN: It's like if you tell
24 somebody once, you then tell them again, then you tell
25 them to repeat it back to you. And when they don't do

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1 it right, you tell them again.

2 MR. ASHCRAFT: Right. Understood.

3 CHAIR BROWN: I've been doing that for 12
4 years.

5 MR. ASHCRAFT: Yes. And I've heard you for
6 12 years, Charlie.

7 CHAIR BROWN: I love it.

8 MR. ASHCRAFT: So, the I&C reviewer should
9 confirm that the applicant has established the
10 appropriate set of principal design criteria,
11 applicable industry consensus standards and applicable
12 NRC regulatory guidance documents that will be used to
13 ensure that the performance measures, defense-in-depth
14 levels and qualification measures are met.

15 The I&C reviewer should also interface --
16 and that's the bottom bubble below the blue box --
17 with other technical disciplines to verify that any
18 cross-discipline area issues are adequately identified
19 and resolved.

20 Slide 9. So -- and that previous slide,
21 that figure was -- is in the DRG as well as this one.
22 So, on this slide, if you recall, from the blue box
23 area, the I&C review applies only if the design review
24 requires a full review of the I&C system, and here is
25 the I&C approach.

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1 So, first, we focus on the architecture
2 and system functions available. And hopefully this
3 portion of the review is started during pre-
4 application meetings.

5 Second, we would review -- the staff
6 review focuses on safety/risk-significant functions
7 and selected structure systems and components, or
8 SSCs, that support them to ensure that the I&C
9 performance objectives are met.

10 And then third, reduced or less staff
11 review effort for the SSCs that are not safety-related
12 without special treatment.

13 Specifically, the staff's review focus is
14 on ensuring that these SSCs will not inhibit
15 performance of the safety-significant functions.

16 CHAIR BROWN: Joe.

17 MR. ASHCRAFT: Yes, sir.

18 CHAIR BROWN: This is all stuff that you
19 would be covering in the pre-application review. We
20 didn't have those 10 years ago, 12 years ago.

21 MR. ASHCRAFT: No.

22 CHAIR BROWN: That was all started again as
23 a result of the early -- those first couple of
24 applications when we didn't have pre-application
25 reviews.

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1 I forgot -- was it ISG-7 or was it 3 or 4
2 -- not 4.

3 MR. ASHCRAFT: Well, there was none for
4 architecture.

5 CHAIR BROWN: It was -- wasn't there an ISG
6 that covered the -- a slightly different approach?

7 MR. ASHCRAFT: I thought the ISGs were
8 focused more on, like, communications and other such
9 things, but possibly. I guess I'd have to go back and
10 check on that, but --

11 CHAIR BROWN: Okay.

12 MR. ASHCRAFT: -- but starting with
13 NuScale -- so, we did a lot of up-front interface with
14 them and, you know, and hammered out -- understood
15 where they were going and what they were trying to do.
16 So, that's really where we started the pre-application
17 approach was for NuScale and mPower.

18 And so, for advanced reactors we got to do
19 an audit -- or we did an audit for Kairos where we
20 strictly went to look at their architecture.

21 So, that is our hope that, you know, if
22 we're going to do an I&C review, that we get in early
23 to understand their architecture.

24 So, it's not necessarily a pre-
25 application, but that's where we hope to start

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1 interfacing.

2 CHAIR BROWN: It was ISG-6.

3 MR. ASHCRAFT: ISG-6. Okay.

4 Okay. Slide 10, please. So, this is
5 going to be a long slide. And while we have them all
6 set up -- they're supposed to come in one at a time,
7 right, Jordan?

8 Well, anyway, it doesn't matter. So --

9 MR. HOELLMAN: Yeah, Joe, they were
10 supposed to. But when I tried to present the
11 PowerPoint, it was taking over my entire -- both of my
12 screens and I couldn't see anything.

13 MR. ASHCRAFT: Okay.

14 MR. HOELLMAN: So, I apologize.

15 MR. ASHCRAFT: No problem. I forgive you.

16 So, this slide -- and I just want to say
17 that we're sort of presenting a lot of -- the second
18 part of the meeting.

19 I want to discuss each -- redundancy,
20 independence, what it is or what we're looking for and
21 how we're planning on reviewing it.

22 So, this is going to be a long slide to
23 get through. So, we're sort of doing some of the back
24 half of the agenda in the slide here.

25 So, for redundancy we're trying to

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1 evaluate the level of redundancy used in the
2 safety-related systems to ensure that no
3 single-failure criteria in the loss of the safety
4 function and; two, removal from service of any
5 component or channel does not result in a required
6 minimum redundancy unless acceptable reliability of
7 operation of the I&C design could be otherwise
8 demonstrated.

9 And some of the things that we'll be
10 looking for is, you know, they need to address -- the
11 applicant needs to address single-failure criteria, if
12 applicable.

13 And the I&C architecture description
14 should describe how redundancy is implemented in the
15 I&C design.

16 The application may address single-failure
17 criteria via identifying potential single failures in
18 the system as part of the safety I&C system hazard
19 analysis and using measures such as redundancy to
20 address/identify single failures.

21 And No. 2, the reviewer should confirm
22 that the application includes an evaluation of the
23 effects of each component failure mode on the overall
24 system.

25 Any component failure mode that could

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1 contribute to a failure of safety-related system is
2 identified.

3 And 3, the design of safety-related system
4 precludes single failures from resulting in spurious
5 actuations and necessary action is taken to eliminate,
6 prevent or control failure modes.

7 And finally, the reviewer should confirm
8 that the application provides information sufficient
9 to demonstrate that all SSCs needed for safe shutdown,
10 as defined for each facility, are sufficiently
11 redundant to address single-failure criteria if
12 applicable.

13 The use of shared data networks (example,
14 ring networks) among multiple safety divisions as
15 single paths for multiple signals or data raises
16 concerns about extensive consequential failures as the
17 result of a single failure.

18 So, the review should confirm that channel
19 assignments to individual communication networks or
20 links could be -- can ensure that adequate redundancy
21 within supported systems is maintained.

22 So, next, we're still on slide 10.

23 MR. HOELLMAN: I got it fixed, Joe, so it
24 would do it the way it was planned.

25 MR. ASHCRAFT: All right. Now, I'm back

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1 in my comfort mode.

2 Okay. So, for independence, the objective
3 of the staff review is to evaluate the methods
4 described in the application used to demonstrate
5 independence of I&C systems between; 1, redundant
6 portions of the safety-related systems such as
7 redundant safety divisions; 2, the safety-related
8 systems and the effects of an LBE and; 3, between
9 safety-related systems and systems that are
10 non-safety-related.

11 Where appropriate, the review -- the staff
12 review should also assess the role of independence in
13 the I&C design systems designated as
14 non-safety-related, but warranting special treatment.

15 The reviewer should evaluate the physical
16 and logical interfaces for I&C system design,
17 including the specific information sent, and the
18 purpose of the information, and the means of sending
19 the information (example, hardware or data
20 communications -- hardwired or data communications).

21 This review should include not only
22 permanent interfaces, but also temporary connections
23 (example, for maintenance workstations).

24 The reviewer should evaluate whether there
25 is sufficient physical separation -- electrical

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1 isolation between equipment belonging to the different
2 safety divisions or; 2, safety-related systems and
3 systems that are not safety-related, such that an
4 electrical fault originating from a safety division or
5 equipment that is not safety-related cannot propagate
6 to another safety division or safety-related system,
7 respectively. If so, the design should ensure that
8 such a fault will not adversely impact a safety
9 function.

10 The reviewer should verify that any
11 electrical isolation devices or measures installed to
12 prevent electrical fault propagation are qualified as
13 part of the safety-related system.

14 And the reviewer should evaluate whether
15 there is sufficient communications independence
16 between equipment belonging to; 1, the different
17 safety divisions and; 2, the safety-related systems
18 and systems that are not safety-related, such that
19 communications failures originating from outside a
20 safety division could not adversely impact the safety
21 function.

22 This evaluation should include
23 identification of potential failures in the
24 communications mechanism and information that is being
25 communicated, and verification that adequate controls

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1 have been implemented to address these potential
2 failures.

3 The reviewer should verify that no safety
4 division is adversely influenced by information
5 received from outside the safety division.

6 This includes verifying that spurious
7 actuations of I&C equipment due to credible failures,
8 or consequential actions of systems that are not
9 safety-related, will not adversely impact the safety
10 function.

11 The reviewer should verify that sufficient
12 measures (example, use of buffer mechanisms) are
13 implemented to minimize the possibility of fault
14 propagation and to increase the reliability of the
15 information being communicated.

16 The reviewer should verify that there is
17 adequate functional independence, if needed, between
18 equipment belonging to; 1, different safety divisions
19 and; 2, safety-related systems and systems that are
20 not safety-related, such that a division does not rely
21 on information from outside the safety division to
22 perform its safety function.

23 To reduce the potential hazards associated
24 with resource sharing, functions that are not
25 necessary for safety should be executed outside the

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1 safety-related system.

2 Next. Diversity. The reviewer should
3 evaluate the common cause failure analysis results
4 provided by the applicant to verify that a potential
5 CCF due to latent systematic faults within the digital
6 I&C system will not result in exceeding the applicable
7 radiation -- radiological release limits.

8 In performing this evaluation for each
9 event evaluated in the safety analysis, the applicant
10 should perform a D3 assessment to determine whether;
11 1, a potential common cause failure due to systematic
12 faults in the digital I&C system could disable a
13 safety function and; 2, a diverse means not subject to
14 the same CCF is available to perform either the same
15 function or a different function such that the
16 radiological release limits are not exceeded.

17 Note the overall analysis of LBEs and
18 related defense-in-depth assessment for safety
19 functions may include the potential contributions from
20 I&C systems.

21 So; 1, identification of digital I&C
22 systems that are vulnerable to a common cause failure;
23 2, analysis of plant response to demonstrate that any
24 radiation release due to a common cause failure of a
25 digital I&C system for each of the events evaluated

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1 and the accident analysis does not exceed the
2 radiological release limits and; 2, the integrity of
3 the functional containment boundary as described in
4 the applicant's PDC is demonstrated.

5 3, a demonstration that for each
6 postulated common cause failure that could disable a
7 safety function within the digital I&C system
8 concurrent with each event evaluated in the plant
9 system safety analysis, a diverse means is identified
10 to provide a diverse or different function.

11 This diverse means could be an automatic
12 function or a manual operator action provided that the
13 applicant has demonstrated that reliable equipment is
14 accessible and available to perform the function and
15 the operator and the equipment will perform the
16 function with the response time credited to perform
17 this function.

18 Equipment that is not safety-related can
19 be used to provide the diverse means provided it's of
20 sufficient quality to perform the necessary function
21 under associated event conditions in a reliable
22 manner.

23 The equipment performing the diverse or
24 different function is diverse and independent from the
25 system subject to the common cause failure.

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1 And if diversity within the system is
2 credited as providing the diverse means of
3 accomplishing the safety function, analysis should be
4 provided to demonstrate adequate diversity within the
5 system (example, diversity of tools used to configure
6 and program each diverse portion of the system, human
7 diversity in the implementation of each diverse
8 portion of the system).

9 If other means are credited to address
10 vulnerabilities to common cause failure, these means
11 should be identified and their effectiveness to
12 eliminate common cause failure vulnerabilities from
13 further consideration should be demonstrated.

14 Provision of a set of displays and
15 controls located in the main control room for manual
16 system actuation of critical safety function and
17 monitoring of parameters that support safety
18 functions.

19 These displays and controls should be
20 independent and diverse from the digital system
21 identifications in 5 and 6 above, which is equipment
22 performing diverse or different functions and
23 diversity within the system is credited.

24 So, let's pause for a second and see if
25 there's any questions on redundancy and independence.

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1 I know that was long-winded and --

2 CHAIR BROWN: I was following you along in
3 the manual.

4 MR. ASHCRAFT: Okay. Yeah. And most of
5 this is taken right out of the DRG. So, you know --
6 okay. Well, if there's no questions, I'm going to go
7 on then.

8 So, the next is diversity. So, we're on
9 diversity -- no, determination and predictability.
10 Did I do diversity? Yeah.

11 Determination and -- so, we used to call
12 it determination and now we call it predictability and
13 repeatability in some areas.

14 But anyway, the reviewer should confirm
15 that the application provides a detailed timing and
16 analysis describing how the I&C systems that support
17 safety-significant functions, including supporting
18 communication systems, address the concept of
19 predictability and repeatability.

20 The reviewer should confirm that the
21 application provides sufficient information (for
22 example, in the form of architectural descriptions,
23 functional block diagrams, descriptions of operation)
24 to demonstrate that the proposed digital I&C system's
25 real-time performance is predictable and repeatable.

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1 The digital I&C system timing analysis
2 identifies limiting response times, digital system
3 timing requirements, architecture and design
4 constraints.

5 The digital I&C timing analysis addresses
6 all system components from signal collection to
7 completion of protective action (example, sensor,
8 transmitter, logic processor, data communication
9 equipment, et cetera).

10 The timing of specific system responses
11 credited in the safety analysis has been allocated to
12 the digital logic portion of the system, as
13 appropriate, and has been satisfied in the digital
14 system architectural design.

15 The digital I&C system timing analysis
16 demonstrates that the safety-significant functions are
17 achieved within times credited in the safety analysis.

18 Data communications in support of the
19 safety-significant functions operate in a predictable
20 and repeatable manner (example, data communication is
21 cyclic, no event-driven data communications,
22 fixed-size and predefined data packets).

23 Design practices that do not implement
24 rigorous real-time as well as predictable and
25 repeatable performance in digital I&C systems are

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1 documented.

2 For those practices identified, verify
3 that the methods used to assessing the risk associated
4 with such design practices have been documented and
5 that such practices cannot affect any
6 safety-significant functions; and the design does not
7 adversely impact any safety-significant functions.

8 Next. Simplicity. So, while review
9 guidance for simplicity is not explicitly provided,
10 the reviewer should verify that the applicant has
11 incorporated this concept in the design.

12 This includes verifying that unnecessary
13 functions and interfaces that are not included in the
14 design that could challenge conformance to the
15 functional I&C principles and measures are included to
16 ensure the I&C systems that are not safety-related do
17 not present an electrical path by which unauthorized
18 personnel can change plant software or display
19 erroneous plant status information for the operators.

20 So, going to slide 11. So, for
21 digital-based safety-related I&C systems, controls are
22 provided on electronic access to safety-related I&C
23 system software and data.

24 Physical and electronic access to data
25 computer-based control system software and data are

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1 adequately controlled to prevent changes by
2 unauthorized personnel.

3 Controls are provided to prevent
4 unauthorized and inadvertent access through network
5 connections and maintenance equipment.

6 Controls are established such that the
7 access to maintenance equipment is limited to only
8 authorized personnel for the period of time that
9 maintenance is being performed.

10 Measures are included to ensure that the
11 I&C systems that are not safety-related do not present
12 an electronic path by which unauthorized personnel can
13 change plant software or display erroneous plant
14 status information for the operators.

15 The DRG does not include a control of
16 access -- does include a control of access section
17 A.6, which is consistent with DSRS Chapter 7 Section
18 7.29, which is more of what Charlie, you know, is
19 being able to control within the safety-related
20 aspects of the plant or of the I&C system.

21 CHAIR BROWN: This is A.6 you've been
22 reading from; isn't it?

23 MR. ASHCRAFT: Some of this is from
24 various other sections in the DSRS.

25 CHAIR BROWN: Yeah. I was following along.

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1 I didn't see any control of access until the appendix,
2 fundamentally.

3 I think that's right. I might be wrong on
4 that. You just brought it up, so that's why I --

5 MR. ASHCRAFT: All right. I'm sorry I
6 did.

7 CHAIR BROWN: No, I guess to talk about --
8 you said controls are provided to prevent unauthorized
9 and inadvertent access through network connections and
10 maintenance equipment. I couldn't restrain myself
11 anymore.

12 That says whatever controls they propose
13 are just fine as long as they say they work.

14 MR. ASHCRAFT: Well --

15 CHAIR BROWN: They could have
16 bidirectional communications from every system in the
17 plant out to the business community.

18 And as long as they had enough hacker
19 controls that they don't -- somebody doesn't take over
20 the whole plant, that's just fine.

21 MR. ASHCRAFT: Well, I'm going to go with
22 my next paragraph and you can stop me again.

23 Well, it says, the DSRS Chapter 7 does not
24 -- but I think it meant to say the DRG does not
25 include provisions regarding the use of hardware-based

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1 one-way communications for --

2 CHAIR BROWN: Where are you now?

3 MR. ASHCRAFT: Well, I'm still on this
4 slide. I'm just trying to touch upon your comments.

5 CHAIR BROWN: Are you back at your backup
6 slide now?

7 MR. ASHCRAFT: No. No. No. I'm still on
8 slide -- the one with control of access.

9 CHAIR BROWN: Okay. But where is this that
10 you're talking about? Is this located somewhere in
11 the document?

12 MR. ASHCRAFT: Well, let me keep going and,
13 yeah, I do mention where it's located.

14 So, what I'm saying is -- so we -- I'll
15 start again. So, the DRG does not include provisions
16 regarding the use of hardware-based one-way
17 communication for trip and safeguard systems.

18 It does include provisions such as the
19 following: In a computer system's one-way broadcast
20 data communication should be used where computer-based
21 systems of higher safety classification provide data
22 to systems of lower safety classification.

23 But, however, the DRG does include
24 provisions such as the following in Section X.2.2.1.1,
25 and this is under Independence, is that the reviewer

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1 should evaluate whether there is sufficient
2 communication independence between equipment belonging
3 to safety-related systems and systems that are not
4 safety-related, such that the communication failures
5 originating from outside a safety division cannot
6 adversely impact a safety function.

7 And it also includes in Section X.1.2,
8 Architecture Assessment Review Criteria, it states:
9 the overall I&C architecture and the architecture of
10 individual systems should factor in design approaches
11 and administrative controls to properly manage
12 internal plant access to systems.

13 In addition, the architecture should
14 factor in the means for addressing the risk associated
15 with remote electronic access to in-plant systems and
16 networks from sources external to the plant.

17 CHAIR BROWN: Joe, stop for a minute.

18 MR. ASHCRAFT: Yes, sir.

19 CHAIR BROWN: You keep saying X.

20 MR. ASHCRAFT: Well, so --

21 CHAIR BROWN: I've got a document that says
22 -- the front page of it says: Revision date 6/01/2020,
23 and you're reading from a document that has a revision
24 date of 4/8/2020.

25 Which is the right one?

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1 MR. ASHCRAFT: Well, I'm going to go with
2 the latest. I mean, the reason why I said X is since
3 we're not officially going to have a Chapter 7, at
4 this point we regulated it to X.1.2.

5 CHAIR BROWN: Well, the version I've got
6 here literally labels these as 7.2, 7.3, this June
7 label.

8 I'm trying to figure out whether I
9 reviewed the right document or not.

10 PARTICIPANT: I've got the other one,
11 Charlie.

12 CHAIR BROWN: Well, I've got them both.
13 I've got them both, but I've got the one that's
14 actually got an ML number on it.

15 PARTICIPANT: I didn't have that one.

16 MR. ASHCRAFT: Well, I'm going to go out on
17 a limb here and say that I think that the only
18 difference between the two versions that you have,
19 Charlie, is we replaced 7s with X.

20 CHAIR BROWN: I think I checked that, but
21 it's also got NLO on it. Actually, it's got an ML --
22 the ML number for that one is identical to the one I
23 reviewed, which is at D302. That one's D302.

24 And so, those versions -- but I don't
25 remember reading what you just read anywhere in the

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1 document.

2 MR. ASHCRAFT: Well --

3 CHAIR BROWN: I was falling asleep while I
4 was doing it, but that's --

5 MR. ASHCRAFT: Well --

6 CHAIR BROWN: Where were you reading from
7 about the DRS does not do such and such?

8 MR. ASHCRAFT: So, the two sections -- so,
9 it's either Section 7.1.2 or X.1.2 depending on the
10 document.

11 CHAIR BROWN: Okay. 7.1.2, right?

12 MR. ASHCRAFT: Right.

13 CHAIR BROWN: 7.1.2, I've got that.

14 MR. ASHCRAFT: But really the latest in the
15 NLO version is the one that has the X.1.2. So, that's
16 the one, that you should be looking at and hopefully
17 --

18 CHAIR BROWN: You said they weren't
19 different.

20 MR. ASHCRAFT: Well, there was a few
21 changes, you know, in the wording, but the overall
22 concepts weren't changed, but we did revise the
23 sections from 7 to X and there were some comments from
24 OTC that we had to take care of.

25 So, there are differences, but --

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1 CHAIR BROWN: I still can't find the words
2 that says we didn't do this or we didn't do that.
3 That's up in the architecture lead-in Section 7.1.2.

4 MR. ASHCRAFT: Oh. Oh. Well, those are
5 not necessarily in the Design Review Guide where it
6 says, you know, it does not include -- I mean, it does
7 include Section A.6, which is consistent with 7.2.9.

8 And then I read something that says, does
9 not include provisions regarding the use of
10 hardware-based.

11 That's not in there. That's just telling
12 you we didn't specifically call it out as
13 hardware-based one-way communications, but in these
14 sections that I've talked about is where we tried to
15 address that one-way diode.

16 And similar --

17 MR. TANEJA: Joe, this is Dinesh.

18 This was to stay consistent with
19 performance-based. I think we were trying to not get
20 technology-specific. We were basically aiming for
21 what the performance requirements are.

22 CHAIR BROWN: You didn't even say
23 unidirectional. Okay. I mean, it's interesting how
24 everything in here allows bidirectional communications
25 anywhere you want to go.

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1 MR. ASHCRAFT: Well -- so, if you look at
2 some of the advanced reactor, I'll say, designs, their
3 ultimate design is to do monitoring control from
4 outside the plant, really.

5 So, you know, you have to be able to, in
6 those scenarios --

7 CHAIR BROWN: Well, no. That's -- you can
8 do that outside the plants as long as they go outside
9 the plant to a dedicated room where there's no
10 internet connection to it.

11 MR. ASHCRAFT: So, you'd consider that part
12 of the -- well, okay.

13 CHAIR BROWN: Yeah. You're controlling it
14 from outside, quote, the reactor compartment, if you
15 want to call it that, okay, in the steam generating or
16 the whatever generating it generates.

17 And if you go out to another building
18 somewhere, that's still -- if that's where the main
19 control is, that's still part of the plant.

20 MR. ASHCRAFT: No, I was referring to the
21 actual plant is in, say, Alaska and they control it
22 from New York.

23 CHAIR BROWN: You have to be kidding me.

24 MR. ASHCRAFT: I'll stop the discussion
25 there, but I think some of the advanced reactors that

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1 are, you know, put it in very remote, desolate areas,
2 yeah, I think that's a -- we haven't seen one of those
3 yet, but that's potential.

4 CHAIR BROWN: I'm just going to ask one of
5 my colleagues to shoot me when this is over.

6 MR. ASHCRAFT: Okay.

7 CHAIR BROWN: I'm sorry. I got to have
8 some humor in here somewhere. This is -- that's not
9 the way I read this stuff -- I mean, that's the way I
10 read it as being very open like that, but I never
11 thought about it that we're going to do this like
12 control a reactor in Alaska from New York.

13 And my response to that is, fine, run a
14 long wire.

15 MR. ASHCRAFT: All right. Well, that could
16 be.

17 CHAIR BROWN: A long wire or a fiber optic
18 link.

19 All right. Go ahead.

20 MR. ASHCRAFT: Yeah. Slide 12, please.

21 MR. TANEJA: I'm going to add a little bit.
22 I was trying to resist, but --

23 MR. ASHCRAFT: Well, thank you, Dinesh.

24 MR. TANEJA: You know, I mean, we have had
25 some pre-application engagements where the claims that

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1 are made on the design is that there is no reliance
2 whatsoever on I&C for safety of the plant.

3 And so, this is the claim and, you know,
4 naturally I think we want to review the evidence
5 whether the claims have any validity or not and -- but
6 for a design that's truly, let's assume, has no
7 adverse impact due to any I&C failures or impacts
8 whatsoever and it does not really have any safety
9 consequences, I think we have to allot, in our review
10 guidance, some latitude on, you know, securing the
11 communication by virtue of safety consideration.

12 So, Charlie, I think we are not letting
13 them, you know, cause any kind of damage to the plant
14 or unsafe condition.

15 Definitely that is our purview that we are
16 going to assure that, but, you know, by mandating your
17 hardware one-way diode communication, we are basically
18 saying, hey, though shalt not use any other
19 technology. You've got to have a guy sitting in
20 Alaska controlling this plant.

21 I think we were trying to give ourselves
22 some latitude to see how we can still secure the plant
23 and not get into this, you know, deterministic, you
24 know, guidance where we say if you don't have that end
25 game, you don't want to go any further. That was the

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1 thought process.

2 MEMBER BLEY: This is Dennis Bley. I'm
3 kind of with Charlie on this one.

4 If you want to be able to do something
5 like that under this guidance, I think you need to be
6 more specific that, you know, you don't want a
7 hardware block unless there's nothing you can do to
8 this plant by this equipment.

9 I mean, we're just asking for trouble or
10 for --

11 MR. TANEJA: That's good feedback. I like
12 that.

13 CHAIR BROWN: Dinesh, let me follow up on
14 Dennis' comment because that's what I was just
15 envisioning.

16 Say you've got a plant in Alaska. You
17 don't need a safety system to shut it down. I'll give
18 you that, okay?

19 You still got to control it. Somehow from
20 this remote location in New York 4,000 miles away, you
21 have to tell it to do things. You also have to get
22 information from that plant to say where it is,
23 whatever data is required.

24 The data that is required can be sent
25 unidirectional to New York. It doesn't have to have

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1 a bidirectional nuance to it.

2 The control signals can be -- you're
3 liable to be in a more problem area, but the
4 fundamental data information that's coming back, you
5 can prevent it from being corrupted by not ever having
6 it go via, you know, something that can be corrupted.

7 MEMBER BLEY: Well, there's even more,
8 Charlie.

9 If you're going to have something from
10 Alaska to New York -- that's a good one to keep --
11 you've got to figure that communications link is
12 vulnerable and will be down a fair amount of the time.

13 And the unavailability of that link, if
14 you could do something to the reactor that would
15 damage it, would be the dominant source of risk for
16 that design.

17 CHAIR BROWN: Good point.

18 MEMBER BLEY: You just have to have
19 something that says, you know, you're not dependent on
20 that communication and that communication can't damage
21 the plant.

22 MR. ASHCRAFT: Right. And so, this is Joe
23 Ashcraft.

24 I'm sorry I brought up that example, but
25 thank you for your feedback and we'll take it into

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1 consideration as we address it and revise -- address
2 public comments.

3 But, you know, we haven't seen that. I
4 mean, there are potential designs that are looking to
5 do that, but predominantly, like Dinesh was saying,
6 there was nothing that an outside signal could do to
7 impact the safety of the plant.

8 So, definitely there could be potential
9 more work that's needed in that area.

10 MEMBER BLEY: But if you want to release
11 this to cover all of those cases, you really ought to
12 have some caveats that makes -- you know, I don't
13 think you've thought that side of it through very far
14 and certainly there's not been much discussion like
15 that in places I've been reading.

16 I know you can have remote plants that you
17 don't need a person there. But if you're actually
18 talking about controlling it, you need to either say
19 this doesn't apply to that or think through what you
20 need to protect the plant.

21 MEMBER MARCH-LEUBA: Let me support my
22 colleagues here. I'm with Dennis and Charlie. In my
23 opinion, this guide should be unidirectional hardware
24 diode. And if a plant was an exception, we look at
25 you.

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1 It should not be generically approved just
2 in case somebody says it. Because the problem is not
3 whether the plant will stand by itself, without a
4 person looking at it. It will and it will protect
5 itself.

6 The problem is a bad actor is control of
7 that line and it starts making bad things into your
8 plant.

9 Take an example of an Apple iPhone, okay?
10 Personally controlled hardware by a single company.
11 Top engineers, they are the smartest guys there are
12 and even the FBI can now get into the phone unless
13 they spend two months or they pay a company on the
14 side and they do. They get into the phone.

15 If you leave the line out, no matter how
16 much security you put, if there is a bad actor,
17 especially a state actor, they will gain control.
18 It's guaranteed.

19 CHAIR BROWN: Okay. Jose just made the
20 point I've made in numerous meetings that the fear
21 here is somebody gains control of one of those
22 incoming lines where they can actually take over your
23 plant.

24 MR. ASHCRAFT: Right. Okay. This is Joe
25 Ashcraft again.

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1 Understood and we'll take back those
2 comments. I mean, I do want to remind, you know, the
3 ACRS that the cyber rule, 10 CFR 7354, still applies,
4 but your comments are well-taken and we'll --

5 CHAIR BROWN: There's a difference and
6 people keep throwing out that bit about the cyber
7 rule. This is not cyber. This is control of your
8 plant. It has nothing to do with cyber.

9 It's like I can have a communication from
10 someplace a half a mile away and you can make that
11 private. It's not cyber.

12 All the stuff inside the plant is direct
13 controlled. All the stuff coming into the business
14 units and everything else, they can do whatever they
15 want to, but you don't have to make yourself sound
16 like you have to have 15 people monitoring every
17 vulnerability of an internet connection that's got
18 access to all your control networks inside of a plant.

19 That just -- have them send data out.
20 It's not -- you don't have any software with it.
21 Therefore, there's no computers. Just sends out a
22 field.

23 MR. ASHCRAFT: All right.

24 CHAIR BROWN: We're mixing apples and
25 oranges with this cyber -- whole cyber thing about you

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1 can't protect your plant because they want to have
2 virus controls on -- how would you like to have McAfee
3 inside your network inside the plant taking over, you
4 know, taking over your plant and constantly having its
5 software changed all the time? You have to be kidding
6 me.

7 MR. ASHCRAFT: The comment --

8 CHAIR BROWN: People are mindless.

9 MR. ASHCRAFT: Comment noted and we'll take
10 that back. You know, just on a side note, my Alexa
11 has taken over my TV.

12 So, All right. Let's go on to -

13 MEMBER MARCH-LEUBA: This is not a
14 microwave. Let me reemphasize what I said before.

15 In my opinion, the -- our guidance -- the
16 guidance from the staff should be, you don't do that.
17 If a plant, because of a special design or a special
18 consideration, wants to do something different, they
19 can always get an exception.

20 CHAIR BROWN: Exactly.

21 MR. ASHCRAFT: Right. And I think that's
22 how we'll approach it and thanks for that input. That
23 sounds reasonable.

24 CHAIR BROWN: It can even be referred to as
25 the preferred approach to doing this as such and such

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1 makes the whole review easy. If you want to do
2 something else, ask.

3 MR. ASHCRAFT: Right. Maybe that flows
4 under simplicity.

5 CHAIR BROWN: Is that technology present
6 today?

7 MR. ASHCRAFT: Yeah. That goes back to
8 simplicity and this doesn't sound very simple, but,
9 yeah, I agree. Comments are well-taken and we'll go
10 -- so, hopefully moving on to slide 12.

11 CHAIR BROWN: All right. Go ahead.

12 MR. ASHCRAFT: Boy, that's the last time
13 I'll bring up an example.

14 So, we're still in the public comment
15 stage. It ends June 29th. To date, we've only
16 received three comments and that was to date as of
17 Friday.

18 I haven't checked it this week, but two of
19 them were almost -- one simply says, we agree. And
20 the other one seemed to be against the DRG, but
21 neither had any proposed changes.

22 And the third had four comments. It was
23 from a stakeholder that's been involved with NEI and
24 various utilities, et cetera.

25 And of those four comments, we concluded

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1 that three out of four should be addressed elsewhere.
2 And for the one, we modified Section X.0.1.2.2 to
3 address the other comment.

4 So, internally we're trying to address
5 comments as soon as they come in and we've tentatively
6 scheduled an ACRS full committee meeting in September
7 of 2020 with the hopes of getting the DRG issued in
8 early fall or as soon as possible.

9 And I'll leave out my comment about COVID
10 since Charlie talked about it up front. So, next
11 slide, which is questions.

12 Like I said, we had some backup slides
13 that sort of address some earlier comments we received
14 from ACRS, but I'll leave it with any questions.

15 CHAIR BROWN: I just lost my comment as you
16 went on there for a minute.

17 The control of access, all the other
18 principles aside, is the biggest vulnerability and
19 Achilles's heel for whether you have a protection
20 system that's required or not because you don't want
21 your controls taken over.

22 And to -- you don't want virus protection
23 software in your control systems telling you that
24 somebody is trying to take it over.

25 It just -- I mean, I thought -- you know,

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1 what's an example I can use? Oh, yeah, what are the
2 ones that monitor -- Experian, TransUnion, whatever it
3 is --

4 MR. ASHCRAFT: Credit scores?

5 CHAIR BROWN: Credit scores. Thank you.

6 I get this email alert. Somebody is
7 trying to change your account. What? Call, if you
8 want to.

9 Well, I called and got somebody that
10 didn't know what they were talking about. So, they
11 transfer me to somebody that did know what they were
12 talking about and she says, there's no alert on your
13 system. All your accounts are secure. Yet, Experian,
14 what, two years ago was hacked and 3-1/2 million
15 people lost all their data.

16 MEMBER BLEY: Don't ever click on those
17 links, John.

18 CHAIR BROWN: I didn't click on a link. It
19 was just an email. It was in the subject. I just
20 read it, okay? And finally I checked that and
21 everything is just fine.

22 And then it turns out as a result of me
23 asking the question, they put a lock on my credit
24 account.

25 Now, it doesn't bother me because I'm not

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1 applying for credit right now. So, if I ever go off
2 and try to get a loan, I'll have to unlock it, but it
3 just -- any time -- I just -- it just boggles my mind
4 to think that we're going to design these systems and
5 give the obvious flexibility for anything in the world
6 and then have to fight against it.

7 And it's got to be like Jose says. You
8 tell them what you want. And if they want to -- you
9 tell them if you want to do something else, let us
10 know, but we don't want -- you know, control of access
11 comes in two varieties.

12 It used to be just physical. Somebody had
13 to go into the plant, down to a cabinet, open a
14 drawer, change parts, put it back in and you had to
15 have somebody else with them to make sure they didn't
16 screw it up.

17 Now, it's the electronic access to that
18 plant. You've taken care of the maintenance stations.
19 All the ones we've looked at, they have maintenance
20 inside the plant, but they have to connect up a cable
21 to go and actually let them do anything and somebody
22 has to go down and do that.

23 So, we've eliminated it for maintenance
24 purposes or changing software. That has to be done in
25 the plant, except now we want to communicate the

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1 direct links from the information going out for both
2 the control systems and the data systems with
3 unidirectional links.

4 You've got to be kidding me. It's like a
5 pipeline. Pretty soon they're controlling your pumps,
6 valves and telling your meters what to read and it's
7 not -- it's not a virus issue. It's just a matter I
8 don't give them a door to come in, period. It's
9 isolation. An air gap.

10 So, anyway, that's the way you ought to
11 write this control of access and you don't have to be
12 specific. You just don't give them a door.

13 MR. ASHCRAFT: Right. I agree, Charlie,
14 and I don't think -- I mean --

15 CHAIR BROWN: I know you do, Joe. Go
16 ahead.

17 MR. ASHCRAFT: well, I was just going to
18 say should a design like that come in, I -- well, and
19 we'll look at those words to see -- you know, the
20 change to it as Jose recommended, but it's not
21 something -- I mean, it's going to be more than just
22 saying, oh, that sounds good, you can do it.

23 CHAIR BROWN: We had to fight -- we had to
24 make a comment on APR-1400. They -- then the KHNP
25 said, we don't want to fight this battle. They just

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1 did it.

2 MR. ASHCRAFT: Right.

3 CHAIR BROWN: Unidirectional hardware for
4 the data going out of the plant.

5 MR. ASHCRAFT: Agreed. Yeah, I remember
6 that battle.

7 CHAIR BROWN: Okay. And NuScale didn't
8 want to do it. They had bidirectional stuff from
9 their in-plant networks out to the -- you know, the
10 alt building networks, you know, the support network
11 out on the business networks and admin and whatever.

12 We said, no, you got to have a
13 unidirectional, you know, non-software control
14 direction data output up there because you don't want
15 somebody coming back in.

16 And everybody argued about that and
17 finally NuScale caved because they weren't going to
18 get ACRS approval.

19 I mean, we would have written a letter
20 that said no and that you all could have ignored us,
21 which you're perfectly right to do and the Commission
22 could have said okay, but I don't think that would
23 have been good advertising for anybody.

24 So -- I mean, and that's the point. We're
25 losing sight, you know, of the -- not just the forest,

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1 but the trees as well.

2 Okay. I'm on a roll. Where are we here?

3 MR. ASHCRAFT: I believe we're done. We
4 blew right through our break, I think, but --

5 CHAIR BROWN: Well, that's okay.

6 Is everybody okay? I don't hear anybody
7 yelling. Let's see. What's next? I've got to go to
8 -- any individual comments from members before opening
9 it up for public comment?

10 MEMBER KIRCHNER: Charlie, this is Walt.

11 CHAIR BROWN: Yeah.

12 MEMBER KIRCHNER: I've sat next to you for
13 a couple years and I've imbibed your principles and I
14 just concur heartily.

15 As Jose said, this is one where you need
16 to be fairly explicit. Not necessarily the
17 technology, but the functionality. So, I just wanted
18 to concur.

19 And then at some point in the future I
20 would like to share with the committee that there's a
21 member who led a design team at Los Alamos for a
22 remotely situated heat pipe reactor that was going to
23 be operated up in Alaska and across Canada. Thirteen
24 sites. And it was going to be remotely connected,
25 encrypted, et cetera, et cetera.

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1 And that drove quite a number of our
2 design choices about I&C and the safety functions of
3 the design, but I'll -- I was keeping quiet there, but
4 I'll just throw that out as a teaser that almost 40
5 years ago we dealt with these issues.

6 And the idea basically was encrypted
7 connection, you lose the connection or the verify --
8 the ability to verify it and the reactor goes down --
9 shuts down and -- so that you don't risk losing
10 control of the system, but it's a nice example, Joe.

11 MR. ASHCRAFT: Yes. And we've really had
12 to come to grips with a lot of these issues.

13 MEMBER KIRCHNER: For the plants, I agree
14 with Charlie. It ought to be explicit.

15 CHAIR BROWN: And you can say be explicit
16 without -- there's such things as non-software
17 configured one-way data communication and what does
18 that mean to you, a data diode?

19 MR. ASHCRAFT: All right.

20 CHAIR BROWN: Isn't that right?

21 Am I wrong, Dinesh? Joe?

22 MR. ASHCRAFT: I was going to say you're
23 right, but then you said --

24 CHAIR BROWN: Either one of you. Well,
25 you're both there so I thought I'd get a twofer out of

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1 this.

2 MR. ASHCRAFT: All right.

3 CHAIR BROWN: But, I mean --

4 MR. TANEJA: I agree. I agree.

5 CHAIR BROWN: Non-software configured
6 unidirectional data, okay, communication that's
7 totally technology-neutral, but says you can't have
8 software involved with the configuration.

9 And if you don't have software involved in
10 the configuration, somebody externally can't change
11 it. They have to go into the plant to change it.
12 That's physical.

13 We know how to do physical access, right?
14 Chains and handcuffs if they don't -- if they violate
15 it.

16 All right. Any other comments from any
17 other members before I go to the public?

18 (Pause.)

19 CHAIR BROWN: Hearing none, Christina, is
20 the phone line open?

21 MS. ANTONESCU: Thomas, can you please open
22 the lines?

23 PARTICIPANT: Yes, phone line is open.

24 MS. ANTONESCU: Thank you.

25 CHAIR BROWN: All right. Thank you,

1 Thomas.

2 Is there anybody on the public line that
3 would like to make a comment? Is there anybody on the
4 public line that would like to say something just to
5 let us know that the line is working?

6 PARTICIPANT: Something.

7 CHAIR BROWN: Thank you.

8 Okay. Hearing no other comments, we can
9 close the public line and I will get my little thing
10 here and we will do the -- we'll go around the table
11 -- or around the Skype table.

12 Dennis.

13 MEMBER BLEY: Yeah. I think things are in
14 pretty good shape. This last discussion is really
15 important. Don't close your eyes to it, you know.

16 The reason there's an NRC today is because
17 60 years ago the AEC's conflicting between promotional
18 requirements and regulatory requirements got them into
19 a bit of trouble that got segregated to make the NRC,
20 which does not have a promotional role and we've got
21 to be careful.

22 Just trying to leave a slot for something
23 you think might be proposed as a new design, you've
24 got to really think that through. I don't think you
25 ought to do it.

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1 CHAIR BROWN: Is that it, Dennis?

2 MEMBER BLEY: That's all.

3 CHAIR BROWN: Okay. Matt.

4 CHAIRMAN SUNSERI: I don't have any
5 specific comments and just would like to thank the
6 staff for their presentation. That's all.

7 CHAIR BROWN: Jose.

8 MEMBER MARCH-LEUBA: I don't have any
9 additional comments. I think it's a good guide. It
10 will be helpful and I think you done a good job.

11 CHAIR BROWN: Vesna.

12 MEMBER DIMITRIJEVIC: No additional
13 comments.

14 CHAIR BROWN: Thank you.

15 Joy.

16 MEMBER REMPE: No additional comments.

17 CHAIR BROWN: Walt.

18 MEMBER KIRCHNER: No additional comments.

19 Thanks, Charlie.

20 CHAIR BROWN: Ron.

21 MEMBER BALLINGER: Yes. Charlie's
22 evangelistic crusade has worked its magic with me as
23 well as Walt. I'm glad -- the presentation was a good
24 one, I thought. Thank you very much.

25 CHAIR BROWN: Okay. Myron.

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1 (Pause.)

2 MR. MOORE: Chairman Brown, this is Scott
3 Moore. Myron had to leave already and he told --

4 CHAIR BROWN: Okay.

5 MR. MOORE: -- Christina and me.

6 CHAIR BROWN: Okay. Thank you.

7 MEMBER DIMITRIJEVIC: Yes. Myron had to
8 leave for personal reasons, yes. He will catch up
9 with me later.

10 CHAIR BROWN: Okay. Thank you. That's
11 good.

12 I just want to finish that I thought the
13 review guide came out pretty good. I think in those
14 areas that we've been discussing that you need to be
15 more crisp.

16 I meant to go nickel and dime you on a
17 bunch of comments. If I can get them written down, I
18 would send them to you.

19 Do we have time? I guess we've got time;
20 don't we? We've covered most of it in our discussions.

21 MEMBER BLEY: Time to do what, Chairman?

22 CHAIR BROWN: I was -- I thought I had a
23 couple of other comments, but I'm just -- I'm looking
24 at my comments that I've got written down in the guide
25 to make sure I didn't miss something. I think I've

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1 covered most of the stuff.

2 I guess one question that I had under your
3 Section 7.2.2.1.2, redundancy, is it implies they
4 don't have to use single-failure criteria that can
5 make a judgment, but it looks like it was -- I don't
6 know if they -- you have a choice of accepting it or
7 they have to demonstrate something. It was a little
8 bit mushy.

9 We talked about the control of access.
10 Independence is fundamental on the control of access.
11 So, we've milked that one fairly well. You've got the
12 watchdog timers fundamentally covered back in A.11.

13 The one thing you didn't cover that I
14 thought would have been useful in this guide was --
15 where was that?

16 Under Manual Controls there's a bunch of
17 your reg guides like 1.162 and ISG-04 and stuff like
18 that -- 1.62, but where we talk about manual controls,
19 if you have manual controls, in this case, okay, with
20 this speculative reactor Joe threw out here, that
21 manual controls ought to be downstream of automatic
22 controls so that they can't be compromised by whatever
23 common cause failure you have.

24 That's missing from the entire document.
25 Nothing about -- under the manual control issue. So,

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1 that was under Section -- Appendix A.10 -- A.9,
2 rather, under the Manual Control part.

3 You might think about introducing some
4 thoughts like that because I -- unless you guys
5 covered this Reg Guide 1.62 and -- but I didn't see
6 any of that specifically listed either.

7 You got that, Joe?

8 MR. ASHCRAFT: Yes, sir. I've got it.

9 CHAIR BROWN: Okay. Other than that, I
10 thought it -- this is a significant advance and I
11 think you guys on the staff have absorbed what we've
12 been doing over the last 12 years and have actually
13 generated a document that is much more flexible and
14 easier to use and it's a top level -- it's like you
15 say, it's a top-down approach as opposed to bottom-up
16 where you review every position and every item and
17 every IEEE standard and every reg guide and then you
18 figure out, do I really have a car or not.

19 And this tells you what the car looks
20 like. We need to know what it looks like before we
21 can give any judgments.

22 And I personally think that's the way to
23 go and I guess the committee has agreed with me up to
24 this point.

25 So, if there's no other comments from

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1 anybody else, I'll give you one more shot.

2 (Pause.)

3 CHAIR BROWN: I want to thank the staff for
4 a pretty -- very good presentation and also for the
5 interaction.

6 I want to throw out interaction between --
7 Christina, who were you talking to most of the time?
8 Are you there?

9 MS. ANTONESCU: I was -- yeah, I have a
10 hard time to get the mic on.

11 I was talking to Jordan.

12 CHAIR BROWN: Jordan, okay. I didn't see
13 a whole lot, but there's been a lot of good -- you
14 know, I really do appreciate what I think is good
15 cooperation between the staff and the committee staff.

16 I think that has worked very well. So, I
17 just want to give everybody a little handshake on that
18 relative to how we proceeded to get here.

19 So, with that in mind, I will close the
20 meeting and we are adjourned and that's it. I don't
21 have a gavel.

22 MS. ANTONESCU: Yeah. Charlie, was David
23 Petti also on the line --

24 CHAIR BROWN Oh, Dave.

25 MS. ANTONESCU: -- if he wanted to make

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1 any comments?

2 CHAIR BROWN: Are you there?

3 MEMBER PETTI: Yeah, I'm here. I'm here.

4 CHAIR BROWN: I forgot you. I'm sorry.

5 MEMBER PETTI: I have no comments.

6 CHAIR BROWN: Okay. I apologize for that.

7 I didn't write your name in here. It wasn't in my
8 handout initially here.

9 All right. Now, we are formally
10 adjourned. Thank you all very much.

11 (Whereupon, the above-entitled matter went
12 off the record at 4:09 p.m.)

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Design Review Guide (DRG): Instrumentation and Controls for Non-Light Water Reactor (Non-LWR) Reviews

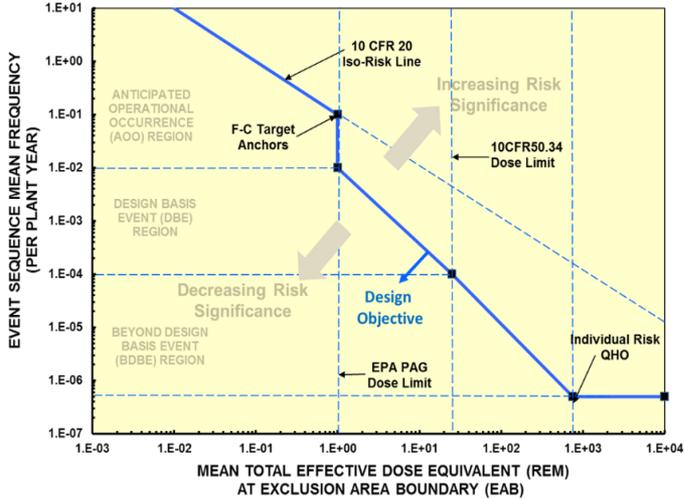
Advisory Committee on Reactor Safeguards
Subcommittee Meeting

June 2, 2020

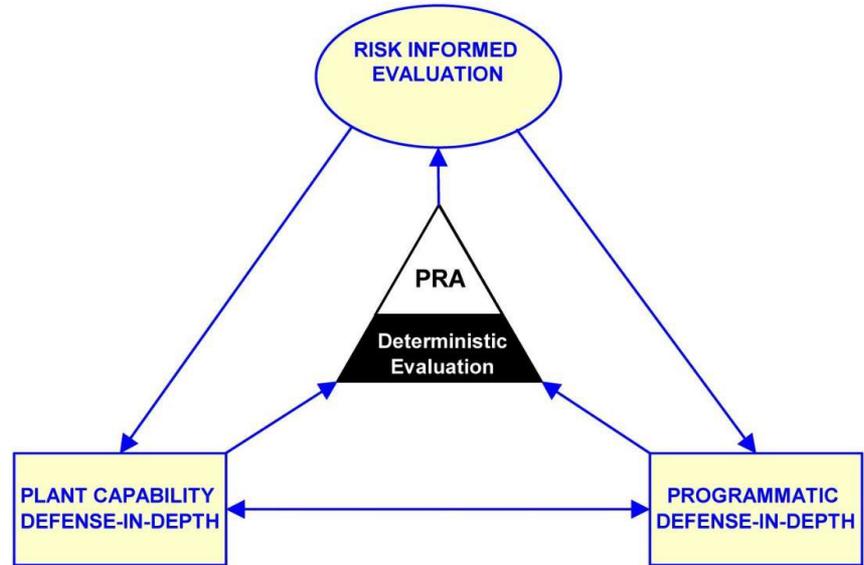
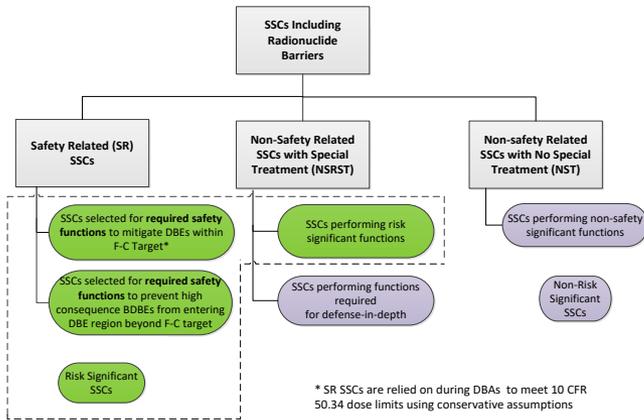
Agenda

- Introduction
 - Licensing Modernization Project (LMP)
 - Core Review Team Approach
 - Instrumentation and Controls (I&C): Safety-Focused Review Initiative
- Overview of I&C Design Review Guide (DRG) to support NRC staff's safety evaluation of advanced non-light water reactor (non-LWR) applications
 - Goal of DRG
 - I&C System Review Framework
 - Overall I&C Staff Review Approach
- Fundamental Design Principles, including Control of Access

Licensing Modernization Project

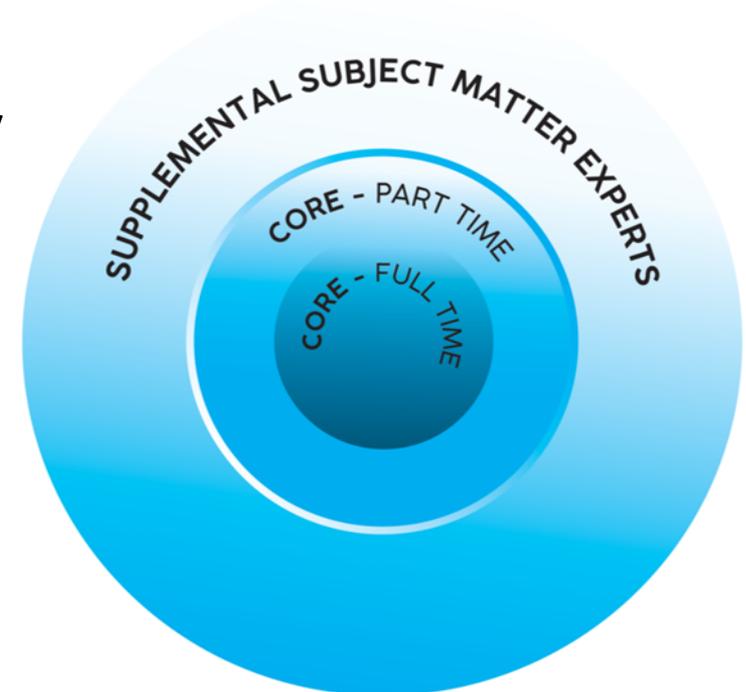


- Licensing Basis Events
- SSC Classification
- Defense in Depth



Core Review Team Approach

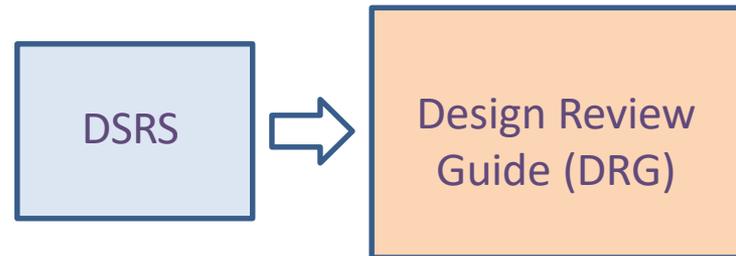
- Non-LWR Review Strategy – successfully implementing for non-LWR preapplication reviews
- Multi-disciplinary core review team supported by subject matter experts from NRR, NMSS, NSIR, RES, OGC
- Focus on the Fundamental Safety Functions
- Perform an Integrated System Design Review
- Demonstrate Compliance with Applicable Regulations



 Color gradient denotes level of effort

I&C Safety-Focused Review Initiative

- Additional lessons learned and new opportunities
- New initiative started
 - Create new, improved guidance for future design reviews in a timely manner
 - Building on DSRS
- Close coordination
 - Advanced reactors
 - I&C modernization
 - Innovation and transformation at the NRC



Evolution of I&C Review Guidance

- NUREG-0800, SRP Chapter 7
 - System-based approach for LWR licensing reviews
 - Guidance not suitable for non-LWRs applications
- NuScale DSRS Chapter 7
 - Improved safety-focused licensing review approach
 - Improved licensing review's efficiency and effectiveness
- Design Review Guide (DRG) for I&C
 - Leverages the DSRS concepts
 - Leverages lessons learned from recent new reactor I&C licensing reviews

Goal of DRG for I&C

- Modernizes the I&C safety review in support of advanced non-LWR licensing applications

Safety-focused

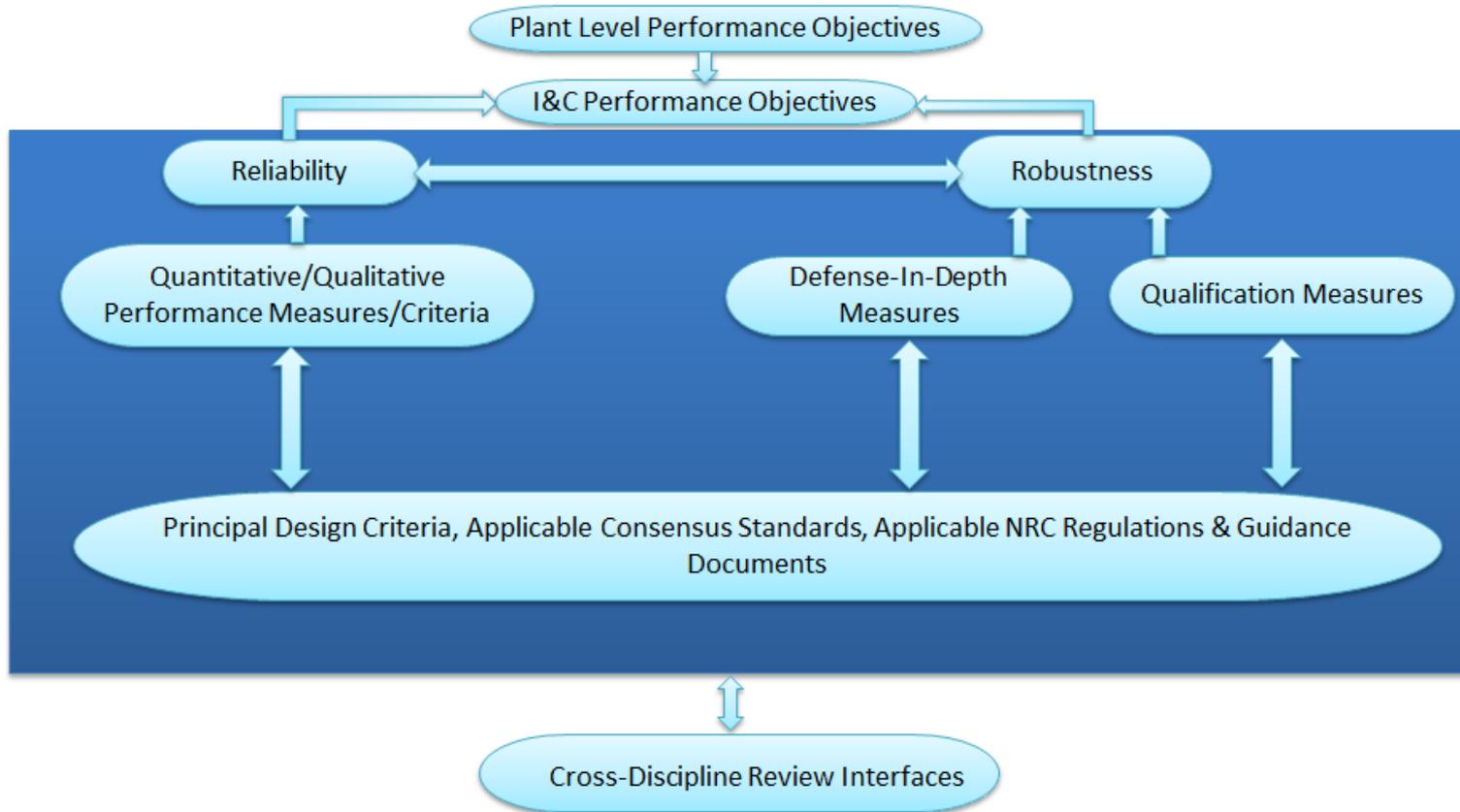
Risk-informed

Performance-based

Technology Neutral

- Supports the NRC's vision and strategy for advanced reactor safety reviews
- Incorporates principles from Draft Regulatory Guide (DG)-1353

I&C System Review Framework



Legend:

 Denotes the I&C review boundary

Overall I&C Staff Review Approach



Architecture

- The staff review starts at the I&C architecture level
- Ensure that the information necessary to understand the proposed I&C architecture and system functions is available



Safety/Risk-Significant Functions

- The staff review focuses on safety/risk-significant functions and selected SSCs that support them
- Ensure that the I&C performance objectives are met



Functions Not Safety/Risk-Significant

- The design-related review for SSCs that the staff determined are not safety-related and not risk significant should be less
- The staff review focuses on ensuring that safety/risk-significant functions will not be impaired by such SSCs

4 Principles plus Simplicity

Redundancy

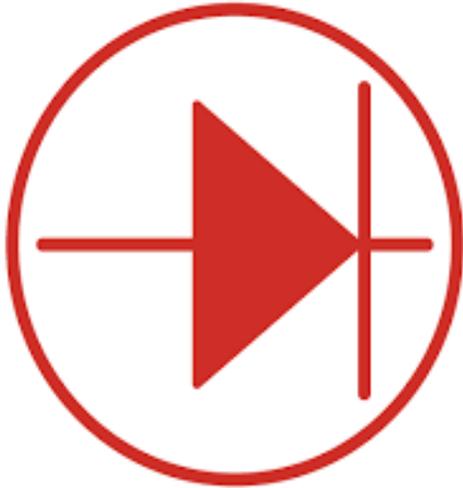
Independence

Diversity

Determinism

Simplicity

Control of Access (Appendix A, Section A.6)



Schedule Milestones

	Activity	Completion Date
A.1	Issue draft DRG for public comments	COMPLETE
A.2	DRG ACRS Sub-Committee meeting	June 2, 2020
A.3	Public comments in-house deadline	June 29, 2020
A.4	Addressing public comments	July-August 2020
A.5	DRG ACRS Full Committee meeting	September 10-12, 2020
A.6	Incorporate ACRS recommendations and prepare final DRG	October 2020



Backup Slides

- How is complete channel or division independence explained to be assured
 - Section X.2.2.1.1 (Independence) of the DRG provides staff’s guidance regarding *“redundant portions of a safety-related system such as redundant safety divisions”* among others
- Is only the processor-based voting unit expected to have a watchdog
 - Such a detailed verification seems beyond the scope of the DRG, which is performance-based, technology neutral guidance. Nonetheless, see resolution to the comment below which seems related to the fundamental concern associated with this comment
- How is the reviewer directed to ensure that hardware-based timers are completely independent of the processor module software and hardware
 - Such a detailed verification seems beyond the scope of the DRG, which is performance-based, technology neutral guidance. Nonetheless, the DRG documents the following review guidance that should address the fundamental concerns associated with this comment: *“The reviewer should verify that the design will have sufficient physical separation or barriers between equipment belonging to (1) different safety divisions ... such that the safety functions credited during and following any [Licensing Basis Event] can be accomplished.”*

Backup Slides (con't)

- Communications of data or control actuation signals from reactor trip circuits or safeguards circuits to external networks or controllers are specified as one-way, hardware-based that cannot have the direction of signal flow changed by software processes
 - Such a detailed verification seems beyond the scope of the DRG, which is performance-based, technology neutral guidance. Nonetheless, the DRG documents the following review guidance that should address the fundamental concerns associated with this comment: *“The reviewer should evaluate whether there is sufficient communications independence between equipment belonging to (1) different safety divisions and (2) the safety-related systems and systems that are not safety-related, such that communications failures originating from outside a safety division cannot not adversely impact the safety function. This evaluation should include identification of potential failures in the communications mechanism and information that is being communicated, and verification that adequate controls have been implemented to address these potential failures.”*

Backup Slides (con't)

- Are data transmissions reviewed to ensure they are one-way, hardware-based unidirectional devices to external plant facilities
 - See resolutions to the above comment and the comment below
- How are networks that have direct access to the trip and safeguards systems reviewed to ensure only unidirectional hardware-based transmitted data or signals will be accepted.
 - See resolution to the above comment. In addition, the DRG documents the following performance-based, technology neutral guidance that should also address the fundamental concerns associated with this comment: “The reviewer should evaluate whether there is sufficient electrical isolation between equipment belonging to ...safety-related systems and systems that are not safety-related, such that an electrical fault originating from ...equipment that is not safety-related cannot propagate to another safety division or safety-related system.... If so, the design ensures that such a fault will not adversely impact a safety function. The reviewer should verify that any electrical isolation devices or measures installed to prevent electrical fault propagation are qualified as part of the safety-related system .”

Backup Slides (con't)

- Are in-plant networks reviewed to ensure they use unidirectional hardware devices to transmit data to any external facilities whose networks have access to the internet.
 - See resolution to the above comment.
- Is the reviewer directed to evaluating how deterministic (repeatable and predictable) processing is employed
 - Yes, the guidance is documented in DRG section X.2.2.1.4 (Predictable and Repeatable Behavior).

Backup Slides (con't)

- Is it clear that a reviewer can determine whether diversity and defense-in-depth is satisfactory based on the guidance in the proposed Ch 7.
 - Yes, the guidance is documented in DRG section X.2.2.1.3 (Diversity in Support of Defense-in-Depth to Address CCFs). But note that it is not clear at this time that the DRG will be labeled as “Ch 7”; it will be up to NRR/DANU determine the chapter numbering for any guidance associated with advanced reactors.

Acronyms

- ARCAP - advanced reactor content of application project
- CCFs - common cause failures
- CFR - Code of Federal Regulations
- DG - draft regulatory guide
- DID - defense-in-depth
- DRG - Design Review Guide
- DSRS - design-specific review standard
- I&C - instrumentation and controls
- IEEE - Institute for Electrical and Electronics Engineering
- LBE - licensing basis event
- LMP - licensing modernization project
- LWR - light water reactor
- NEI - Nuclear Energy Institute
- non-LWR - non-light water reactor
- NMSS - Office of Nuclear Material Safety and Safeguards
- NRR - Office of Nuclear Reactor Regulation
- NSIR - Office of Nuclear Security and Incident Response
- OGC - Office of the General Counsel
- PDC - principal design criteria
- RES - Office of Nuclear Regulatory Research
- SMR - small modular reactor
- SRM - staff requirements memorandum
- SSCs - structures, systems, and components
- Std - standard
- TICAP - technology-inclusive content of application project

Afternoon meeting

Conversation (39 Participants)

Request Control Actual Size

51:59

39 Participants

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

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Dennis Bley Guest

6

2:45 PM 06/02/2020

Windows taskbar: File Explorer, Edge, Word, PowerPoint, Zoom, etc.

Conversation (39 Participants)

Request Control Actual Size

52:28

39 Participants

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Protecting People and the Environment

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Dennis Bley Guest

6

2:46 PM 06/02/2020

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