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12	proceeding of the United States Nuclear Regulatory
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2	NUCLEAR REGULATORY COMMISSION
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4	ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
5	(ACRS)
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7	DIGITAL I&C SUBCOMMITTEE
8	+ + + + +
9	WEDNESDAY
10	OCTOBER 21, 2020
11	+ + + + +
12	The Subcommittee met via Video
13	Teleconference, at 9:30 a.m. EDT, Charles Brown,
14	Chairman, presiding.
15	COMMITTEE MEMBERS:
16	CHARLES H. BROWN, JR., Chairman
17	WALTER L. KIRCHNER, Member-at-large
18	RONALD G. BALLINGER, Member
19	DENNIS BLEY, Member
20	VESNA B. DIMITRIJEVIC, Member
21	JOSE MARCH-LEUBA, Member
22	DAVID A. PETTI, Member
23	JOY L. REMPE, Member
24	MATTHEW W. SUNSERI, Member
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1	ACRS CONSULTANT:
2	MYRON HECHT
3	
4	DESIGNATED FEDERAL OFFICIAL:
5	CHRISTINA ANTONESCU
6	
7	ALSO PRESENT:
8	JOSEPH ASHCRAFT, NRR
9	JORDAN HOELLMAN, NRR
10	JOHN SEGALA, NRR
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1	T-A-B-L-E O-F C-O-N-T-E-N-T-S
2	Opening Remarks by Chairman
3	by Charles Brown 4
4	Opening Remarks by Staff
5	by John Segala
6	NRC Refresher Review of How the New DRG is Organized
7	Around the Fundamental Principles and How the Review
8	Process Will Ensure That Each Principle is Met in the
9	Design
10	by Jordan Hoellman and Joseph Ashcraft 10
11	Discussion of Staff Changes Made as a Result of the
12	June SC Meeting
13	Questions and Comments 61
14	Public Comments
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1	PROCEEDINGS
2	(9:31 a.m.)
3	CHAIR BROWN: Good morning. The meeting
4	will now come to order. This is a meeting of the
5	Digital I&C Subcommittee. I am Charles Brown,
6	Chairman of this subcommittee meeting. ACRS members
7	in attendance are Dennis Bley, Matt Sunseri, Jose
8	March-Lueba, Vesna Dimitrijevic, Joy Rempe, Ron
9	Ballinger, Dave Petti, and we have our consultant,
10	Myron Hecht is also attending.
11	Christina Antonescu of the ACRS staff is
12	the designated federal official for this meeting.
13	Christina, I presume the court recorder is set up?
14	MS. ANTONESCU: Yes, John.
15	CHAIR BROWN: Thank you.
16	MS. ANTONESCU: Brandon is joining us.
17	CHAIR BROWN: Thank you. The purpose of
18	this meeting is a bit of a refresher review and how
19	the new revised Draft Design Review Guide:
20	Instrumentation and Controls for Non-Light Water
21	Reactors is organized, around fundamental principles
22	and how the review process will ensure that each
23	principle is met in the design.
24	Also the purpose of the meeting is to
25	discuss what staff changes were made as a result of
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1	the June 2nd Digital I&C Subcommittee meeting, and
2	other changes, how public comments were addressed, how
3	the incorporated comments modified what was presented
4	in June, and how the resolutions impacted how the
5	fundamental principles are applied by reviewers.
6	Today, we have members of the NRC staff to
7	brief the subcommittee. The ACRS was established by
8	statute and was governed by the Federal Advisory
9	Committee Act, FACA. That means that the committee
10	can only speak to its published letter reports.
11	We hold meetings to gather information to
12	support our deliberations. Interested parties who
13	wish to provide comments can contact our office
14	requesting time.
15	That said, we set aside ten minutes for
16	comments from members of the public attending, or
17	listening to our meetings. Written comments are also
18	welcome.
19	The meeting agenda for today's meeting was
20	published on the NRC's public meeting notice website,
21	as well as the ACRS meeting website. On the agenda
22	for this meeting, and on the ACRS meeting website are
23	instructions as to how the public may participate,
24	where requests for making a statement to the
25	subcommittee has been received from the public.

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Due to COVID-19, we are conducting today's meeting virtually. A transcript of the meeting is being kept and will be made available on our website. Therefore, we request that participants in this meeting first identify themselves and speak with sufficient clarity and volume so that they can be readily heard.

All presenters, please pause from time to 8 9 time to allow members to ask questions. Please also indicate the slide number you are on when moving to the next slide. 11

We have a bridge line established for the 12 public to listen to the meeting. The public line will 13 14 be kept in a listen only mode until the time for 15 public comment. To avoid interference, I request all 16 attendees make sure they are muted while not speaking.

17 Based on our experience with previous virtual meetings. I just lost my place. I would like 18 19 to remind the speakers and presenters to speak slowly. We will take a short break after each presentation to 20 allow time for screen sharing, as well as at the 21 Chairman's discretion during longer presentations. 22

Lastly, please do not use any virtual 23 24 meeting feature to conduct sidebar technical Rather, contact the DFO if you have any 25 discussions.

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technical questions so we can bring those to the floor.

3 We have scheduled an ACRS full committee 4 meeting in December based on this outcome of this 5 Digital I&C Subcommittee meeting. We will now proceed with the meeting, and I will ask Mr. Jordan Hoellman 6 7 to share his screen with us while Mr. John Segala, the 8 Branch Chief of the Advanced Reactor Policy Branch, in 9 Division of Advanced Reactors the and Nonpower Production Utilization Facilities, in the Office of 10 Nuclear Reactor Regulation, for any introductory 11 remarks to make before we begin today's presentations. 12 John, do you have any comments? 13

14 MR. SEGALA: All right. Thank you very 15 much and good morning. The purpose of today's 16 briefing, as you said, is to provide the members an 17 informational overview of the Design Review Guide for Instrumentation and Controls for Non-Light 18 Water 19 Reactor Reviews.

The presentation will provide a history of the development of the guidance, and describes changes made to address ACRS observations and public comments. I wanted to take this opportunity at the beginning of the meeting to place this effort in context with the broader staff efforts to develop

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advanced reactor guidance.

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The development of the instrumentation and control Design Review Guide, which started to identify and apply insights and lessons learned from past new reactor application reviews that are important to be captured and addressed in order for the Agency to be ready for a future new or advanced reactor licensing applications.

9 The Design Review Guide was initiated 10 prior to and for the most part was developed separately from the commission approved Licensing 11 Modernization Project, and before the recent start of 12 associated with 13 activities the industry-led 14 Technology-Inclusive Content of Application Project, 15 or TICAP, and the staff-led Advanced Reactor Content 16 of Application Project, ARCAP, which will provide 17 quidance for risk informing the scope and level of detail of an application. 18

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

23 More recently, as the instrumentation and 24 control guidance was further developed, it 25 incorporated concepts from the Licensing Modernization

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1	Project. The staff is considering how to integrate
2	this specific I&C guidance into its overall guidance
3	on application content and will continue to ensure
4	that the Design Review Guide remains aligned with
5	TICAP and ARCAP efforts.
6	The staff does believe that the guidance
7	for instrumentation and control provides an important
8	example of how a review can be performed using
9	concepts from the Licensing Modernization Project.
10	We're looking forward to hearing from the ACRS on this
11	important topic, and any insights and feedback that
12	you all may have.
13	If ACRS writes us a letter following the
14	full committee meeting, the NRC will finalize the DRG
15	after we address any issues identified by the ACRS.
16	I would now like to turn the meeting over to Jordan
17	Hoellman to begin the presentation.
18	CHAIR BROWN: John?
19	MR. SEGALA: Yes?
20	CHAIR BROWN: Our intention right now is
21	to provide a letter subsequent to that December
22	meeting. So we'll make sure we contact you with
23	ensure we have any observations from this meeting and
24	anything else that comes up prior to the December
25	meeting.
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1	MR. SEGALA: Okay. That would be great.
2	CHAIR BROWN: Okay.
3	MR. SEGALA: Thank you.
4	CHAIR BROWN: Okay. Thank you, John.
5	MR. HOELLMAN: Okay. This is Jordan
6	Hoellman. I'm a Project Manager in John's branch, in
7	the Office of Nuclear Reactor Regulation. I'm sharing
8	my screen. I assume everyone can see it.
9	MR. HECHT: I'm seeing only the title
10	chart. Is that what you're displaying?
11	MR. HOELLMAN: Yes.
12	CHAIR BROWN: Slide 1 is what we've got
13	up.
14	MR. HOELLMAN: Slide 1, okay. I just
15	wanted to make sure before I continued. I'm going to
16	move to Slide 2. So I'll provide a brief overview of
17	the I&C Design Review Guide, which provides guidance
18	for the NRC staff to use in reviewing the I&C portions
19	of applications for advanced non-LWRs within the
20	bounds of existing regulations.
21	This guidance leverages the NuScale DSRS
22	Chapter 7 framework while factoring in lessons learned
23	from new reactor reviews. The guidance supports the
24	NRC's vision, strategy, near term implementation
25	action plains, or IAP's. Specifically, the guidance
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1	supports IAP Strategy 3, which involves developing
2	guidance for flexible regulatory review processes for
3	non-LWRs within the bounds of existing regulations.
4	And to a new non-LWR regulatory framework
5	that is risk informed and performance based. And that
6	features staff's review efforts commensurate with the
7	demonstrated safety performance of non-LWR
8	technologies.
9	So as Charlie mentioned earlier, we'll
10	provide a refresher review of how the DRG is organized
11	around the fundamental principles of redundancy,
12	independence, diversity, determinism, and simplicity,
13	and how the review process will ensure that each
14	principle is met in the design.
15	Then we'll discuss some of the revisions
16	we made to the DRG since our June subcommittee
17	meeting, including the significant revisions to
18	address ACRS observations, and some representative
19	revisions to address the public comments.
20	I would note that the resolutions to the
21	public comments did not impact how the fundamental
22	principles are applied by the reviewer, and did not
23	modify the DRG concepts that were presented during the
24	June 2020 meeting.
25	So I will move onto
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1	(Simultaneous speaking.)
2	MEMBER KIRCHNER: This is Walt Kirchner.
3	MR. HOELLMAN: Yes, go ahead.
4	MEMBER KIRCHNER: Just a clarification.
5	On your title slide, it says non-LWR. On this slide,
6	it's advanced reactors. I'm just it seems like
7	certainly for I&C, it doesn't matter what the flavor
8	of the reactor is. And you point out that it has to
9	be within existing regulations. So why would this not
10	just apply to all advanced reactors?
11	MR. HOELLMAN: So
12	MEMBER KIRCHNER: Do you see what I'm
13	getting at? Your title slide says non-LWR.
14	MR. HOELLMAN: I understand what you're
15	saying. And we agree. And we believe that the DRG is
16	technology-inclusive and can be used for any new
17	reactor. The reason, I guess, it's titled as for non-
18	LWRs is because it was developed to address the
19	immediate needs associated with the non-LWR community
20	consistent with the Reg Guide 1.233 and NEI-1804,
21	which will be discussed in the next slide.
22	NEI-1804 also has the non-LWR moniker in
23	the title of that document, as well. But I think we
24	believe that if an applicant can demonstrate that the,
25	you know, well, we believe it's technology-inclusive
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1	in that we can use it in reviewing any new reactor
2	applicant.
3	And I think, you know, as we work through
4	with the Technology-Inclusive Content of Application
5	Project and the Advanced Reactor Content of
6	Application Project, John discussed in his opening
7	remarks that will get fleshed out and we'll be able
8	to, you know, this guidance will be referenced and be
9	able to be used for any new reactor applicant.
10	MEMBER KIRCHNER: That's good Jordan.
11	Okay. I just wanted to I thought that was your
12	intent. So thank you for the clarification.
13	CHAIR BROWN: This is Charlie Brown.
14	Walt, thank you for chiming in. I missed your name.
15	I apologize for leaving you out of our counting of
16	members.
17	MEMBER KIRCHNER: That's fine, Charlie.
18	I had technology difficulties getting on on my
19	computer.
20	CHAIR BROWN: All right. Well, one other
21	point relative to your comment, which is quite to the
22	point. The intention with our letter in December is
23	to make that exact point. So if I forget that, make
24	sure you remind me at the full committee meeting.
25	MEMBER KIRCHNER: I will, yes.
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1	CHAIR BROWN: I bet you I won't forget it
2	though. It'll be in the letter that it's our
3	impression that it should be applied across the board.
4	So thanks a lot for bringing that up. Go on, John.
5	MR. HOELLMAN: Okay. Thanks, Chairman
6	Brown. So I'll move onto Slide 3 then. And we
7	certainly understand the comment and I think that's
8	something that, you know, as we move forward with some
9	of our advanced reactor activities, we'll need to
10	align on what we're You know NEIMA uses the
11	definition of advanced reactor, I'm not sure where
12	we're going to use that definition, but we definitely
13	agree that the DRG is technology-inclusive and can
14	apply to any new reactor.
15	MR. SEGALA: Jordan, this is John Segala.
16	Just supplement everything, I agree with everything
17	that was said. Just to supplement, you know, we
18	started this whole activity on the DRG before NEIMA
19	existed. We started it before LNP, and at that time,
20	we were, we had a DSRS, a Design-Specific Review
21	Standard for the NuScale light water SMR review.
22	And so we wanted to see, you know, what we

could develop in terms of a technology-inclusive approach for non-light water reactors because we didn't have an I&C guidance document for that area.

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1	So we, as Jordan said, we started off working on this
2	document for non-lights specific, because of the gap
3	that we were trying to fill.
4	And then subsequent to that, you know,
5	NEIMA came out and defined advanced reactors to also
6	include light water SRM's and because this was a
7	technology-inclusive guidance, it was very easy to
8	expand the scope to include light water SRM's as well.
9	But there's no reason, as Jordan said, it
10	can be used for any new reactor, regardless because of
11	the technology-inclusive nature.
12	CHAIR BROWN: I'm going to amplify that a
13	little bit. Not only did it it really didn't start
14	with NuScale weight. It really, this DSRS concept
15	really evolved out of the ESBWR I&C reviews and the
16	AP1000 I&C reviews. And mPower, the SMR for mPower,
17	actually developed the initial versions of this
18	design-specific review standard, which then was, I
19	guess, mucked around on a little bit and applied to
20	NuScale as well. And it worked well.
21	Also, the concept was applied in the
22	subsequent reviews of the AP1400 and now the NuScale
23	designs. So it's been this approach has been used
24	extensively after those first early new design
25	applicants applied, AP1000 and ESBWR. Just a little
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1	more highlighting.
2	MR. HOELLMAN: Okay. Thanks, Chairman
3	Brown. So I'll continue Slide 3. The NRC has engaged
4	with the Licensing Modernization Project, or LMP that
5	was led by Southern Company, coordinated by the
6	Nuclear Energy Institute and cost shared by the
7	Department of Energy.
8	The LMP's objective is to develop
9	technology-inclusive, risk-informed, and performance-
10	based regulatory guidance for licensing non-LWRs for
11	the NRC's consideration and possible endorsement.
12	The LMP document, which is NEI 18-04,
13	outlines an approach for use by reactor developers to
14	select licensing basis events, classifies structures,
15	systems, and components, or SSC's, permits special
16	treatments and programmatic controls, and assess the
17	adequacy of a design in terms of providing layers of
18	defense-in-depth.
19	And SRM SECY-190117, the commission
20	approved the use of the technology-inclusive risk
21	performance based methodology, described as a
22	reasonable approach for establishing key parts of the
23	licensing basis and content of applications for
24	licenses, certifications, and approvals for non-LWRs.
25	The NRC published guide 1.233 on June 9th,
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2020, which endorses the principles and methodology in NEI 18-04 as an acceptable method. The methodology described in NEI 18-04 and Regular Guide also provided general methodology for identifying an appropriate scope and depth of information to be provided in applications to the NRC for licenses, certifications, and approvals.

8 The DRG has been coordinated to align with 9 the risk-informed performance-based LMP framework, and 10 provides review guidance on all aspects of safety 11 significant I&C systems, which include safety-related 12 I&C systems and I&C systems that are not safety-13 related but warrant special treatment.

14 Although the DRG aligns with the LMP 15 framework, the DRG also provides the flexibility for 16 NRC staff to perform I&C reviews for applications that 17 do not implement LMP framework, and the staff will continue to ensure that the DRG aligns with the 18 19 industry led TICAP project, the NRC led ARCAP project, and other advanced reactor initiatives including the 20 future Part 53 Regulatory Framework. 21

So I think that's all I wanted to discuss or highlight again on this slide. So I'll move onto Slide 4 unless there are questions. Okay. On Slide 4 and, I think at this point, I'm going to turn it

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18 over to Joe Ashcraft who has a little more broader 1 perspective on the evolution of the I&C quidance 2 3 throughout the use. 4 MR. ASHCRAFT: Thank you, Jordan. Hello. 5 My name is Joe Ashcraft and I am an I&C Technical 6 Reviewer in NRR. I was part of the team for the 7 development of the NuScale design-specific review 8 guide and mPower, for that matter, for Chapter 7, and 9 the Design Review Guide, DRG, as we currently call it. 10 So starting, as Chairman Brown stated, we started getting these lessons learned with the ESBWR 11 So we've just been, you know, kind of 12 and APR1400. carrying it forward as we went to the ACRS for various 13 14 certifications. 15 So just to talk about the SRP, I mean, it is still the primary staff guidance and the staff's 16 use of the 2007 revision has been effective for light 17 water reactor reviews. Due to its nature, though, the 18 19 of the SRP for new reactors have not been use optimized in the past. 20 So the staff wanted to improve how we did 21 I&C reviews for small reactors, remove requirements 22 that no longer applied to SMR's like IEEE standard 23 24 279, and to remove duplicate reviews of the same requirements as many of the requirements were reviewed 25

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1	in each set of chapters of the SRP. And I guess the
2	best example would be independence.
3	I mean we did it for the RPS, the SFAS,
4	and any other safety related, and then we turned
5	around and did it for the non-safety side, looking
6	back. So we thoroughly did reviews of independents
7	many, many times.
8	So the DRS, the commission's policy on the
9	reviewers small modular reactors expects the staff to
10	develop and use design-specific review standards for
11	each application for efficiency and effectiveness. So
12	we took this opportunity to develop the DSRS for I&C
13	that is significantly different from the SRP, the
14	concept of one review or one certain request for
15	additional information as needed.
16	The DSRS reflects the four fundamental I&C
17	design principles plus one concept by having sections
18	for independence, redundancy, predictive, and
19	repeatability, adversity, and defensive depth plus
20	simplicity, which we added as an appendix along with
21	the approved layout and dilution of guidance
22	duplication.
23	It is a simpler, more risk informed,
24	safety focused corporate lessons learned. And our
25	objective was to prove the safety focus of the staff
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1	reviews by ensuring the applicant has official
2	licensing basis details presented in the application.
3	And to clearly demonstrate that the applicable
4	regulations are met, and the fundamental I&C design
5	principles were addressed.
6	We improved the efficiency of reviews by
7	eliminating unnecessary information from being
8	docketed and reviewed and by improving guidance to
9	avoid unnecessary or repeated RAI's.
10	Note that the use of the DSRS for NuScale
11	has been a huge success. Early availability of it,
12	along with closed per application coordination with
13	the applicant was essential. And unlike other
14	previous new reactor applications, the NuScale
15	licensing review was completed earlier than most other
16	areas of the certification and with no significant
17	challenges.

So, you know, bringing everything we learned from new reactors, and even the NuScale, we started developing the DRG. So it is an evolution of the DSRS, or it reflects the safety focus approach from the DSRS, including the four fundamental I&C design principles, plus simplicity.

24 But, it was developed while factoring 25 feedback from the lessons learned initiative by the

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5 So the next slide discusses the goal for this document. So let's go to Slide 5. So the DRG 6 7 goal is to modernize the I&C safety review in support 8 of advanced non-light water licensing applications. 9 within this goal or objective will Success be 10 reflected by simpler, streamlined, and agile I&C and regulatory infrastructure that will 11 review, effectively address I&C designs for new and advanced 12 non-light water reactors. 13

14 The I&C DRG was initiated as a proactive 15 way to modernize the I&C safety review of advanced non-light water applications by providing 16 (audio interference) technology-inclusive, risk-informed, and 17 performance-based reviews. 18

19 As demonstrated by the experience with NuScale I&C review, the staff believes that the DRG 20 quidance will lead to more effective and efficient 21 Making it available for non-light water 22 reviews. designers early will help to establish predictable and 23 24 efficient I&C reviews processes while the common goal of safety is ensured. 25

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The DRG supports the NRC vision and strategy for advance reactor safety reviews, as it could be used by advanced reactors with vastly different technologies. Also, the DRG allows for our flexible review process within the bounds of existing regulations.

7 The ACRS subcommittee observation from 8 June 2020 and NEI comment 4-2 noted that the DRG 9 methodology could be used for evaluation of any new 10 reactor design, light water or non-light water. And 11 while the staff agrees, the DRG technology-inclusive 12 is technology-inclusive and can be used for any new 13 reactor applicant.

14 It was developed to address the immediate
15 needs associated with the non-light water community,
16 consistent with Reg Guide 1.233 and NEI 18-04.

The LMP review framework and terminology cites the significance endorsed Reg Guide 1.233 is factored into the DRG. Again, although the DRG aligns with the LMP framework, the DRG provides flexibility for the staff to perform I&C reviews for applications that do not implement the LMP framework. So Slide 6, please. CHAIR BROWN: Don't go yet.

24 CHAIR BROWN: Don't go yet.

MR. ASHCRAFT: Well, I paused.

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1	CHAIR BROWN: You didn't pause quite
2	I had to clear my throat there for a minute.
3	MR. ASHCRAFT: Okay.
4	CHAIR BROWN: I just want to make one
5	observation. I mean, it's or yes, I guess it's an
6	observation. You don't have to do anything. It's
7	just to make sure we understand that the four goals
8	that you lay out, in terms of the modernization, don't
9	compromise at all the application of the fundamental
10	design principles for safety instrumentation and
11	control systems.
12	All four of the major items that we talk
13	about are consistent with this approach in the
14	modernization. I hope people (audio interference)
15	risk-informed performance-based that all of a sudden,
16	we don't have to have independence, defense-in-depth,
17	redundancy, or deterministic type processing.
18	You're supposed to say we agree. I'm
19	waiting.
20	MR. ASHCRAFT: We agree. Sorry. Jordan,
21	were you agreeing? This is Joe Ashcraft. Yes. I
22	guess we'll see it in the slide, but yes. We agree.
23	CHAIR BROWN: Okay. I looked through the,
24	as I was going through this whole guide, I mean,
25	excuse me, the whole DSRS, I did not see any place
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1	where it appeared, well, there was a couple which I'll
2	bring up later, which we're going to need to discuss,
3	where I'm going to try to understand whether there's
4	compromise or not. But I'm saving those until you
5	finish.
6	MR. ASHCRAFT: Okay. Yes. This is Joe
7	Ashcraft again. I guess I'd like to just say in
8	general, too, that, you know, so we have what we call,
9	and we'll see on the next slide, the I&C review, but
10	above that is the advance reactor review team. So
11	any, you know, exemptions or whatever that could
12	impact portions or slightly impact, would be addressed
13	there with I&C support, obviously.
14	But generally speaking, we don't envision
15	any, you know, major changes to the four principles
16	and simplicity.
17	CHAIR BROWN: Okay. Thanks.
18	MR. ASHCRAFT: All right. Next slide. So
19	and this is what I was referring to, so if you see the
20	top two, well, let me this is our, sort of our top
21	down review approach. And this depicts the flow of
22	reviewer should a full I&C review be required. And
23	kind of, I just mentioned, should there be any
24	exemptions, et cetera, that could impact, you know, a
25	portion of what's inside the blue box, possibly.
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The two top bubbles are performed by the core review team, defines the support as necessary. In this review we'll formulate what, if any, of the blue box areas may be needed to be adjusted by the I&C staff.

So getting into the blue box area, and I 6 7 don't know, I think in the last meeting, we didn't 8 really highlight the fundamental principles, as well 9 as we got them here, but you really got it broken down at the almost half, you know, one side will be looking 10 at reliability and the other side, robustness, which 11 defense-in-depth would include measures, 12 the fundamental I&C principles. 13

14 Also qualification measures and then you 15 this portion, the supporting attributes can see That's really done by another chapter, but 16 quality. 17 we are, you know, we coordinate it and we ensure that our equipment falls within the four brands, et cetera, 18 19 and meets the qualifications that's needed to support the I&C. 20

And on the other side, for liability, I mean, basically, as you can see in this slide, we go down that route. We do that anyway, but we're going to, you know, we'll start seeing more and more selfdiagnostic features and fail-safe designs and, you

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1	know, that sort of thing. So that's really what this
2	slide is to look at.
3	And then down below, the four principles,
4	we added simplicity, and when you think about it,
5	simplicity really aids in review of independence. If
6	you got an architecture where you've got wires coming
7	and going from all over the place, it just really
8	drags the review.
9	So the more simple your safety design is
10	and that you show the inputs and outputs and how it's
11	not impacted by non-safety say, the easier the review.
12	And at the bottom, we have the PDC's, which
13	essentially are, you know, modified GDC's, but they're
14	called PDC's. And we also have our other consensus
15	standards and applicable NRC regulations and guidance
16	documents.
17	And at the bottom, this just really shows,
18	we did it more in the DSRS than we've probably ever
19	done in other reviews. Well, I say that but we really
20	interfaced with all the other chapters more, and you
21	saw it with the boron distribution issue, and others.
22	But I mean, we really interfaced better with the other
23	chapters for the NuScale review and we plan to carry
24	that going forward because we feel that that's really
25	beneficial and it's helped a lot.
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1	So I'll pause just a moment.
2	MEMBER BLEY: Yes, thanks. This is Dennis
3	Bley. Well we used to have simplicity as one of our
4	principles. We kind of gave up because the industry
5	sort of missed the opportunity for that early on, that
6	with some of the new designs, maybe we can get back to
7	it. I think all of us agree, that's the best first
8	step that we can take to meeting all the others.
9	MR. ASHCRAFT: Right. And I agree. And
10	what happens, so for the NuScale DSRS, I mean, we
11	really didn't have a regulation to slap on it, per se,
12	so that's why we moved it to an appendix. But we
13	stress simplicity, just like we stress review of the
14	architecture.
15	So you know, as we interface with new
16	applicants, we stress the simplicity aspect of it, you
17	know. There might not be a lot of gotchas or RAI's,
18	but I mean, the more simplistic thing they can design,
19	the easier it's going to get through a review. And
20	maybe that's our best seller in that regard.
21	But yes, we found from the NuScale, both
22	review and architecture up front, and, you know, the
23	review and the simplicity of their design really,
24	really aided in getting through their review with a
25	safety evaluation approved.
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1 Okay. Let's go to next slide. So this is our review approach and as you can see, we start with 2 the architecture. We try to get in as soon as we can. 3 4 I mean, every advanced reactor meeting that I was 5 going to before, and even now, you know, they're talking fields and stuff, and I always try to pop in. 6 7 Hey, I haven't seen your architecture, you know, you 8 got to be working on it. 9 So we feel that we're going to focus on 10 the architecture and system functions availability, and hopefully this portion of the review has started 11 during the pre-app meetings. 12 Then we go, the second the staff reviews focuses on safety, slight risks, 13 14 significant functions, and selected structures,

15 systems, and components that support them to ensure16 that the NRC performance objectives are met.

17 And then lastly, you know, they do staff reviews efforts on the SSC's that are not safety 18 19 related, without special treatment, specifically the staff review focuses on ensuring that these SSC's will 20 performance safety significant 21 not inhibit of functions. 22

And, you know, and I say this, so all the designs coming in, you know, they've got different, you know, designs and I&C's different, and, you know,

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1	the non-safety, safety, so, you know, I say it's
2	reduced or less, but I mean, this is actually just as
3	important as any of the rest.
4	So let's go to Slide 8.
5	CHAIR BROWN: Can you back up a minute?
6	MR. ASHCRAFT: Sure.
7	CHAIR BROWN: I just wanted to emphasize
8	just a thought of why the committee started taking
9	this approach of focusing so hard on the architecture
10	back in the ESBWR days, in 2008, and '09, and '10.
11	Took almost two years to get through that. And a
12	well-defined architecture where you see and can
13	confirm that independence, is critical to almost
14	satisfying and understanding why that system is going
15	to be reliable and robust, particularly from a
16	defense-in-depth standpoint.
17	If you don't know what your architecture
18	is crisply and cleanly, it's difficult to know where
19	you need to apply more defense-in-depth. A good
20	architecture that meets all four principles has
21	anywhere from five or six defense-in-depth mechanisms
22	built into it. Then you can focus on what other
23	critical areas might compromise that.
24	Without the architecture, you're lost.
25	And that's why we've been pretty pleased with the
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30 evolution and how we've developed, the staff has run with this and developed this overall approach. But the architecture is just critical for every aspect of ensuring that you're going to be able to accomplish each of the goals. I just wanted to get that in for the record purposes.

MR. ASHCRAFT: This is Joe Ashcroft again. 8 9 And to piggy-back on that, Chairman Brown, I'm so used 10 to calling you Charlie. But Chairman Brown. Last year, we did an audit for the Kairos project at the 11 time they were coming in, I don't know where they're 12 But we did an audit of their architecture and I 13 at. 14 guess they had a few guys from the NuScale that was 15 part of that team.

But they really did a good job of laying out their architecture and their drawings, et cetera. So we're pleased with the message that has gone out and we're starting to see it as we interface with, you know, various applicants or potential applicants.

CHAIR BROWN: That's good to hear. Thank

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23 MR. ASHCRAFT: All right. Slide 8 please. 24 So this is going to be long and winded, but I'm going 25 to kind of go through each of these redundancy

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1 independence, diversity, and determinism, which we call predictability and repeatability. 2 And then 3 simplicity. 4 So a lot of this is straight out of DRG so 5 if at any point, you want me to go on, that's fine last 6 So redundancy, and I know at the too. 7 subcommittee meeting, there was some observations on 8 some of the words that, you know, were a little bit 9 Charlie just addressed earlier about, you vaque. 10 know, what we will be doing in our I&C review. So we modified that, as you probably saw, 11 Charlie, because I know that you probably zoned in on 12 that. But anyway, let me just start with redundancy. 13 14 I mean, the redundancy review, we'll evaluate the 15 level of redundancy used to the safety related system to ensure that no single failure results in a loss of 16 17 safety function and removal from service of any component or channel does not result in the loss of 18 19 the required minimal redundancy, unless the acceptable reliability of operation of the I&C design can be 20 otherwise demonstrated. 21 And you know, so that applicant should 22 address the single failure criteria, if applicable, 23 24 and I&C architecture description should be described on how redundancy is implemented in the I&C system

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The applicant then addresses the single failure criteria. They identified any potential safety failures in the system as part of the safety I&C hazard analysis and using measures, such as redundancy, to address these single failures.

The reviewer should confirm that 7 the application includes an evaluation of the effects of 8 9 each component failure mode on the overall system. Any component failure mode that could contribute to a 10 failure of the safety related system is identified, 11 and the design of the safety related system precludes 12 single failure from resultant spurious actuations and 13 14 necessary actions taken to eliminate, prevent, or control failure modes. 15

And the reviewer should confirm that 16 17 application provides information sufficient to demonstrate that all SSC's needed for a safe shutdown 18 19 defined for each facility, are sufficiently is redundant to address single failure criteria, and the 20 use of shared data networks among multiple safety 21 divisions is the single pass for multiple signals or 22 data raises concerns about the extensive consequence 23 24 of failure as a result of a single failure.

So that goes back to the architecture, you

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1	know, we'll see that there. So let's get into
2	independence. And this is
3	CHAIR BROWN: Joe?
4	MR. ASHCRAFT: Yes?
5	CHAIR BROWN: When you talk about
6	redundancy, you mentioned the words several times,
7	single failure. Later in the document, Reg Guide
8	1.233 is brought out and effectively says you have to
9	evaluation whether you're going to use single failure
10	criteria or not. It effectively says you can design
11	your systems without paying any attention to single
12	failure.
13	How in the world are you going to review
14	to confirm single failure doesn't apply? Has any
15	thought been given to that? There is no standard.
16	There's no guidance for doing that.
17	MR. ASHCRAFT: Well, yes. And I was
18	trying to state it up front. So the advance core
19	review team, should an applicant come in and say, you
20	know what, we don't need to do a single failure
21	criteria. And I'm not saying, we haven't seen any,
22	but I'm not saying we're not. But we will have to
23	look at that very up above the I&C portion, and I
24	think I&C would be involved as part of that review to
25	determine that and like you just stated, maybe that's
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34 1 something that we're going to have to, you know, create something to better define 2 how we would evaluate that. 3 4 But assuming it doesn't, you know, get 5 into the I&C review, then we would review it as we always do. But if it does, you know, if their design 6 7 is such that their claiming and we agree, then that's where that would be a -- I can't think of the words. 8 9 But that's where they would, that would be done up 10 front and I quess, as you say Charlie, we probably need to create something that would help us, should we 11 see an applicant come in claiming that. 12 It would be interesting. 13 CHAIR BROWN: 14 Effectively, that says you can have a single channel 15 or maybe no channel. 16 MR. ASHCRAFT: Yes. 17 CHAIR BROWN: If you really want to go to the extreme. I'm being a little bit extreme when I 18 19 But a single channel was kind of sav that. - regardless of what type of marvelous, safe, never will 20 fail, never will break, and will never have any 21 problems, the people advertised, it's kind of hard to 22 believe that a reasonable level of redundancy and 23 24 independence of those redundant protections, or safety 25 systems, are not going to be needed.

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1	Anyway, that's just a thought. But how do
2	we do that?
3	MR. ASHCRAFT: And I agree Charlie. We'll
4	take that observation
5	(Simultaneous speaking.)
6	CHAIR BROWN: I'm not saying you got to
7	put it in this. It's just think about it for the long
8	term. That's all.
9	MR. ASHCRAFT: I agree.
10	MEMBER BLEY: This is Dennis, Dennis Bley.
11	I got to chime in a little on here.
12	CHAIR BROWN: That's fine.
13	MEMBER BLEY: There's no way one meets the
14	kind of reliability needs you're going to have, if you
15	don't have those things. They're the simplest set of
16	things to get you a highly reliable system. So I
17	can't imagine that anybody would try it and I can't
18	imagine they'd succeed if they tried it because they
19	won't be able to show they have good reliability.
20	CHAIR BROWN: One of the sections in the
21	DRG, Dennis, actually talks about single failure, in
22	1.233. I've forgotten what section it is.
23	MEMBER BLEY: I understand.
24	CHAIR BROWN: Yes.
25	(Simultaneous speaking.)
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1 MEMBER BLEY: Single failure is no form of meeting redundancy requirements and, you know, 2 you 3 just can't get there without those kinds of 4 requirements.

5 CHAIR BROWN: Exactly. That's my thought exactly. That's why I was a little bit concerned with 6 7 having it in there, but it meets the overall quidance of the SECY's and the SRN's and the NEI document and 8 9 the new Regular Guide that just went out. It's out on the street now, I guess. 10 It's no longer a draft quide. 11

MR. ASHCRAFT: This is Joe Ashcraft. 12 So in some of the earlier meetings with stakeholders, and 13 14 this was on the advanced reactor, not necessarily the 15 But that was one of the comments of, you know, DRG. 16 of being able to design that out. And at the time, I 17 just replied, well, it's part of, you know, 10 C.F.R. or IEEE 603 requirements. So it would have to be an 18 19 exemption and, you know, they would have to, you know, provide why they feel it's not needed. 20

And, you know, like you said, I just think that would be a hard way to go. But it's something, as with any requirement, if, you know, they could use to show how they meet it differently.

CHAIR BROWN: Okay. You can go on.

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1	MR. ASHCRAFT: Yes. I agree. So back to
2	Slide 8. I think it's Slide 8.
3	CHAIR BROWN: Yes, you're on independence.
4	MR. ASHCRAFT: Right. Okay. Yes.
5	Something popped up and I didn't see it. Okay. So
6	independence. So the reviewer is to evaluate the
7	methods described in the application used to
8	demonstrate independence of the I&C systems between
9	redundant portions of the safety related systems, such
10	as redundant safety systems, the safety related
11	systems and the effects of LBE.
12	And between safety related systems and
13	systems that are not safety related. So more
14	appropriate, the staff review should assess the role
15	of independence in I&C systems designated as not
16	safety related, but warranting special treatment. And
17	we would also evaluate the physical and logical
18	interfaces with I&C system design, include specific
19	information sent and the purpose of the information,
20	and the main sending the information. Example,
21	hardware or data communications hard wire or data
22	communications.
23	This review clears not only permanent
24	interfaces, but also temporary connections for
25	maintenance and workstations.
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1 The reviewer should evaluate whether 2 sufficient electrical isolation equipment there's belonging to different 3 safety divisions, safety 4 related systems and systems that are not safety 5 related, such as the electrical fault originating from one safety division, or equipment that is not safety 6 7 related cannot promulgate into another safety 8 division, or safety related system respectively. 9 So if so, the design assures that such a 10 fault would not adversely impact a safety function. The should verify that any electrical 11 reviewer isolation devices or measures installed to prevent 12 electrical fault promulgations are qualified as part 13 14 of the safety related system.

The reviewer should evaluate 15 whether 16 sufficient communication independence between 17 equipment belonging to different safety divisions, the safety related systems, and systems that are not 18 19 related, such communication failures safety as originating from outside a safety division cannot 20 adversely impact the safety function. 21

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

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controls have been implemented to address these potential failures.

3 The reviewer should verify that no safety 4 division is adversely influenced by information received from outside the safety division. This includes verifying that spurious actuation of I&C 6 equipment due to credible failures or consequential 8 actions of systems that are not safety related, will 9 not adversely impact the safety function.

And the reviewer should verify sufficient 10 measures, use of buffer mechanisms are implemented to 11 minimize (audio interference) fault promulgation and 12 to increase the reliability of the information being 13 14 communicated.

The reviewer should also verify there's 15 adequate functional independence, if needed, between 16 the equipment belonging to different safety divisions, 17 and safety related systems, and systems that are not 18 19 safety related. Such that a division does not rely on information from outside the safety division to 20 perform a safety function. 21 To reduce potential hazards associated with resource sharing functions 22 that are not necessarily for safety should be executed 23 24 outside the safety related system.

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So let's move onto diversity.

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1	CHAIR BROWN: Can you back up?
2	MR. ASHCRAFT: Sure.
3	CHAIR BROWN: When you talk about I
4	didn't, I'm not quite sure where I was going to make
5	the comment. Part of the means to achieve
6	communications independence. I mean, there's a lot of
7	communication, you know, between safety systems and
8	then the systems that they actuate in some
9	circumstances, which are to control and/or safeguard
10	systems. And/or any other non-passive or passive
11	initiating systems that we may have in the future.
12	And you did address this back in the
13	appendix about unidirectional communications outside
14	the plant. But some of those, if you look at NuScale,
15	for instance, we had unidirectional communications
16	from the safety off to the systems they did need to
17	actuate anything. So they combined it in two
18	different ways.
19	You didn't talk about, if you don't have
20	unidirectional in some cases, you can't, you won't
21	have independence if it's software type
22	communications, other than hard wired. And a bistable
23	signal is quite safe. But a software signal is not if
24	it's bidirectional.
25	I kind of, I didn't say anything, I did
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1	not make a comment based on the independence section
2	of you all's X.2.2 point whatever. Okay? Sufficient
3	communication independence. But not in every
4	circumstance, but in some circumstances, the
5	communication out of the safety systems, the
6	unidirectional is a critical item. And you addressed
7	it in the appendix but it was not reflected up either
8	in the predictability and, what did you call it?
9	Predictability and repeatable behavior.
10	CHAIR BROWN: Right.
11	(Simultaneous speaking.)
12	CHAIR BROWN: Or in the independence. It
13	is in the appendix, I think, I forgotten where. It's
14	A-9. Yes, in section A-9.
15	MR. ASHCRAFT: Right. Well, we'll take
16	that back as an observation to see if we need to move
17	it up there somewhere to highlight it more.
18	CHAIR BROWN: Well just a reference to
19	the, you know, the concept in the appendix.
20	MR. ASHCRAFT: Right.
21	CHAIR BROWN: Independence gets hefted by
22	utilizing and then reference the appendix. We don't
23	need to, you know, put the repeat the stuff all
24	over the place. Just reference the appendix where
25	that information is contained.
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1	MR. ASHCRAFT: Understood.
2	CHAIR BROWN: Okay. Seemed to me in the
3	predictability and, you know, 2.2.1.4, and behaviors
4	section, and the independence section, that might be
5	a place where you want to just reference that
6	particular part of the appendix, which I think is A-9,
7	or something like that.
8	Right. It is A-9. And we'll get to that
9	section later in the slides. But thank you for that
10	and we'll take that observation down.
11	MR. ASHCRAFT: Okay. Thank you. So,
12	let's continue with diversity. So the reviewer should
13	evaluate the common cause failure analysis results
14	provided by the applicant to verify the potential CCF
15	due to a latent systematic fault within the digital
16	I&C will not result in exceeding the apical
17	radiological release limits.
18	In performing this evaluation for each
19	even evaluated in the safety analysis, the applicant
20	should perform a D3 assessment to determine whether a
21	potential common cause failure due to systematic
22	faults in the digital I&C could disable a safety
23	function and a diverse means not subject to the same
24	common cause failures available to perform either the
25	same function or a different function, such that

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1	radiological limits are met, or not exceeded.
2	Note that the overall analysis of LBE's
3	and related defense-in-depth assessments for safety
4	functions may include the potential contributions from
5	I&C systems.
6	So you know, we're going to identify,
7	identification of digital I&C systems that are
8	vulnerable to a CCF analysis of plant response to
9	demonstrate the radiation release due to a CCF of the
10	digital I&C system for each of the events evaluated
11	and accident analyses do not exceed the limit. The
12	integrity of the functional containment, should there
13	be one, as described in applicable PDCs as
14	demonstrated.
15	A demonstration for each postulated common
16	cause failure that could disable a safety function
17	within the digital I&C system concurred with each
18	event evaluated in the plant safety analysis. A
19	diverse means as it's been identified to provide a
20	diverse and different function. This diverse means
21	could be an automatic function or a manual operator
22	action provided the applicant has demonstrated that
23	reliable equipment is accessible and available to
24	perform the function, and the operator and equipment
25	will perform the function within the response time

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credited to perform these actions.

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Equipment that is not safety related can be used to provide a diverse means provided it's sufficient quality to perform the necessary function under associated vent conditions in an allowable manner.

7 The equipment performing the diverse or different function is diverse and independent from the 8 9 system, subject to the common cause failure, and if diversity within the system is credited as providing 10 the diverse means accomplishing the 11 of safety function, analysis should be provided to demonstrate 12 diversity within 13 adequate the system, such as 14 diversity of tools used to configure and program each 15 diverse portion of the system, human diversity and implementation of each diverse portion of the system. 16

If other means are credited to address 17 vulnerabilities to common cause failures, these means 18 identified and their effectiveness 19 should be to eliminate common cause failure vulnerabilities from 20 further consideration should be demonstrated. 21 Provisions of a set of displays and controls located 22 in the main control room for manual system level 23 24 actuation of critical safety functions and monitoring of parameters that support a safety function. 25

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These displays and controls should be independent and diverse from the digital I&C system identified in the part of the discussion about, that talked about diversity, well, item five and six, which would be in the DRG.

6 So let's move onto determinism, a.k.a. 7 predictability and repeatability. The reviewer should 8 confirm that the application provides a detailed 9 timing analysis describing how the I&C systems that 10 support the safety significant functions, including 11 support of communication systems, address the concept 12 of predictability and repeatability.

The reviewer should confirm that the application provides sufficient information. For example, in the form of architectural descriptions, functional block diagrams, description of operations, to demonstrate that the proposed digital I&C real time performance is predictable and repeatable.

19 Just a few items. The digital I&C system timing analysis identifies limiting response times, 20 system timing requirements, architecture 21 digital design constraints. The digital I&C timing analysis 22 addresses all system components from signal collection 23 24 to completely of protective action, e.g., sensor logic processor, 25 transmitter, data communication

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equipment, et cetera.

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

And just to highlight that, I mean, so in your exit analysis, you may have two or three seconds to perform that safety function, but the I&C digital response could be -- is typically in the microseconds or milliseconds, as a minimum.

The digital I&C system timing analysis 12 demonstrates that the safety significant functions are 13 14 achieved within the times credited in the safety 15 analysis. Data communications in support of safety significant functions operate in a predictable and 16 17 repeatable manner. Data communication is cyclic. No event driven data communications fixed size and 18 19 predefined data packets.

20 Design practices that do not implement rigorous predictable 21 real time as well as and repeatable performance in the digital 22 I&C's are For those practices identified, verify 23 documented. 24 that the methods used for assessing the risk associated with such design practices 25 have been

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1	documented and such practices cannot affect the safety
2	functions and the design is not adversely impacted in
3	a safety significant function.
4	So I'll end up this slide with simplicity.
5	CHAIR BROWN: Can you back up a second?
6	MR. ASHCRAFT: Sure.
7	CHAIR BROWN: Under the deterministic
8	part, and I may have jumped in earlier, not exactly
9	the same way. But in your section, Appendix A, there
10	is the section on logic processing units being
11	monitored by an independent hardware based diverse
12	means.
13	MR. ASHCRAFT: Yes.
14	CHAIR BROWN: Okay. That's Section A-9,
15	also. I think it's one of the items. This, that's
16	really part of the predictable and repeatable behavior
17	also in order to make sure it's predictable and
18	repeatable. So it doesn't lock up.
19	Again, a reference would be useful that
20	that is covered in the appendix, as well. That's
21	another observation.
22	MR. ASHCRAFT: Okay. Noted.
23	CHAIR BROWN: I'll send you all a copy of
24	these more detailed comments, or observations, via
25	Christina after the meeting. As soon as I get them
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1	into the record.
2	MR. ASHCRAFT: Okay. Thanks, Chairman
3	Brown. All right. So let's finish up this slide with
4	simplicity.
5	CHAIR BROWN: Actually, I was talking
6	about the
7	(Simultaneous speaking.)
8	MR. ASHCRAFT: Yes. I was going to say
9	that but I didn't' want to, you know, extend the
10	conversation.
11	CHAIR BROWN: That's okay. It's all these
12	other buzzwords, it's really the watchdog.
13	MR. ASHCRAFT: Exactly.
14	CHAIR BROWN: Thank you.
15	MR. ASHCRAFT: Okay. For simplicity, so
16	while review guides for simplicity is not explicitly
17	provided, the reviewer should verify that the
18	applicant has incorporated this concept in design.
19	And this includes verifying that unnecessary functions
20	and interfaces are not included in the design. They
21	could challenge the conformance to the fundamental I&C
22	design principles.
23	And measures are included to assure I&C
24	systems that are not safety related do not present
25	electronic path, which is unauthorized changed plant
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1	software or display erroneous plant status information
2	to the operators.
3	So in a way, I mean, simplicity really
4	just aids in being able to look at independence, et
5	cetera. So they all work hand in hand. And the more
6	complex a system, the harder it is to do an evaluation
7	on.
8	So let's go to the next slide. Slide 9.
9	Okay. So this is one of the ACRS observations from
10	the June 2nd meeting. So we revised, to be more
11	explicit, about the communications plan. As a result,
12	as you can read it here, and I could read it if you
13	like. But this is the change that we made into Item
14	6 of the Section X.0.1.2. It really highlights the
15	enforce the unidirection communication features.
16	CHAIR BROWN: Joe?
17	MR. ASHCRAFT: Yes. I'm pausing. I know
18	you got something to say, Chairman.
19	CHAIR BROWN: No, no. This is fine. I
20	had no problem with this. It's just that that is an
21	important feature and that was not reflected in any
22	section in the appendix, and I thought something that
23	mentions or observes this particular thought process
24	should be in, I think, Item 6, A-6, as in concert with
25	either Items 2 or 3 back in the appendix.

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1	MR. ASHCRAFT: Okay.
2	CHAIR BROWN: But the appendix, that part
3	of the appendix, I've forgotten what in the world that
4	says. That's under automatic and manual control. No.
5	That's the wrong one. What did I just say.
6	(Simultaneous speaking.)
7	CHAIR BROWN: I got the wrong one. I
8	apologize. Hold on. No. It's just, it's what you
9	have, it's that paragraph reflected back in A-6.
10	That's all. I didn't have any more on that.
11	MR. ASHCRAFT: Okay. Yes. We'll take a
12	look at the DRG and the appendix to see if, to include
13	effective pointers. So thank you for that comment.
14	Next slide. Slide 10. So this was a
15	serious observation on manual controls. We revised it
16	to what is covered in their guide, 1.62, and the
17	change that we made to the DRG, specifically the
18	statement shown and the slides were copied from the
19	Regular Guide 1.62 under the meeting the BTP 7-19
20	guide and section.
21	And this is based on the Commission's
22	direction documented in the SRM SECY-93087, which
23	includes a statement such as the following. The
24	displace you control will be independent and diverse
25	from the safety computer system identified in Items 1

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1	and 3 of the SRM.
2	So we added this, revised this section to
3	reflect what you see on the screen.
4	CHAIR BROWN: I do have a comment on that.
5	I'm trying to find it now. Oh, that is reflected,
6	that particular item 089, right? This, I guess I
7	don't understand or actually I disagree. You say
8	manual controls may be connected either to discrete
9	hardware and hard wired components, or to simple
10	dedicated and diverse software based.
11	Now we're going to introduce software back
12	into the manual operation. And that does not make a
13	whole lot of sense to me. And I may have missed it in
14	an earlier version. I think I went back and checked
15	and couldn't find it. That's been added. And I guess
16	I would have taken a different approach to saying
17	that, relative to you can connect it to simple
18	dedicated discrete hardware logic components, but not
19	software based logic components.
20	That just, it blows my mind that we've now
21	we've gone and said manual operations should be
22	downstream of software, but that we're going to use
23	software to complete the operation. That's kind of an
24	inconsistent thought.
25	MR. ASHCRAFT: All right. So we're, you

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know, we're thinking to consider, but keep in mind, well, the goal here is for an independent diverse from the digital I&C safety. So we're thinking of maybe changing that last sentence. But it may not answer your comment. But should confirm that the manual controls are independent and diverse from the digital I&C safety systems.

8 CHAIR BROWN: Yes, but you still got 9 software. You're now down to software that is single 10 channel, when you talk about diverse software basis. 11 It's a different type of software, but it's a single 12 channel by the time you get down to turning stuff off, 13 or turning it on.

MR. ASHCRAFT: Right. I mean --

15 CHAIR BROWN: You have no redundancy in 16 that or anything else on that. And that's the purpose 17 of going back to hard wired switch type control. 18 Whereas, you can go to a hard wired digital logic, 19 which I think NuScale did in their priority logic 20 units.

21 MR. ASHCRAFT: Right. Well, we'll take 22 this observation back. I think what -- I thought what 23 we tried to do was incorporate what was in Regular 24 Guide 1.162, but, you know, your concern, we'll take 25 back.

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1	CHAIR BROWN: Yes. I don't remember that
2	being in 1.162. If it is, we should've scrubbed it.
3	I was, I missed it when we reviewed that.
4	MR. ASHCRAFT: Well, it's under the
5	meeting, the BTP 7-19 guidance section. But we'll
6	take a look at it, Charlie.
7	(Simultaneous speaking.)
8	CHAIR BROWN: I've got a problem with that
9	in BTP 7-19 as well.
10	MR. ASHCRAFT: Well, and you know, that's
11	a good point I'll just make. You know, as some of
12	these other things, like BTP 7-19 and et cetera, I
13	mean, we're trying to keep ahead, or maybe well, we
14	are ahead, but you know, the changes in those type of
15	documents could cause revisions in what we're doing
16	here.
17	So we're constantly keeping up with what
18	all is going on in the digital I&C world. So next
19	slide, 11.
20	So we had 69 public comments, 46 resulted
21	in some type of change to the DRG, and the resolutions
22	to the public comments really didn't modify the DRG
23	concepts that were presented during the June meeting,
24	including how the fundamental principles are applied
25	by the reviewer.

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1	I just want to note that the industry,
2	NEI, indicated its positive feedback on the DRG. They
3	commended the staffs safety focus, risk informed,
4	performance based, technology neutral approach, a lot
5	of the LMP, as well as the core review team approach
6	that we used.
7	In addition, it stated the issuance of a
8	design review guide on instrumentation controls for
9	the new reactors will be will contribute to
10	regulatory stability and clarity.
11	So we reviewed each of the public comments
12	and I think we provided you with the comment
13	resolution file. And if it's not public, it should be
14	soon, I believe. But
15	CHAIR BROWN: You couldn't tell us in this
16	slide how you incorporated this?
17	MR. ASHCRAFT: Well, I'm getting to that,
18	Chairman.
19	CHAIR BROWN: Okay. I read your response
20	and it's really murky.
21	MR. ASHCRAFT: Well, okay. Sorry about
22	that.
23	CHAIR BROWN: I'll let you go ahead and
24	give the response. And then I'll murky-ize it for
25	you.
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1	MR. ASHCRAFT: You're trying to throw me
2	off my game here.
3	So I just want to say, we reviewed all the
4	public comments and despite the number of comments, I
5	just want to reemphasize that the resolution of the
6	comments resulted in clarifying DRG content versus
7	making any substantive or drastic changes to the
8	document.
9	So for this particular slide, this was
10	their comment, and what, you know, so they were
11	saying, well, you see what they're saying. They
12	thought maybe we should somehow better describe the
13	definitions of fundamental I&C design principles. So
14	our response was, is so we disagreed with the proposed
15	change and the term fundamental I&C design principles,
16	which were first defined and explained in the NuScale
17	DSRS Chapter 7, Section 7.1 and we give the ADAMS
18	number.
19	And it's used in the same manner in the
20	DRG as an evolution from the NuScale, DSRS. And so
21	what we did do, so this fundamental I&C design
22	principles could be used as a vehicle for meeting
23	PDCs, but are not equivalent.
24	So what we changed is in, and maybe we
25	didn't say the section, but there's a section that
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1	just pointed to the NuScale DSRS Chapter 7, but we
2	added Section 7.1 so that you could go right to 7.1
3	and see that all of the design principles were
4	CHAIR BROWN: Let me just the reason I
5	say this is fuzzy, I think you should have been more
6	forthright. In fact, I went back last night and went
7	through the entire DRG and found eight or nine actual
8	statements of fundamental I&C design principles
9	followed by the string of redundancy, independence, et
10	cetera, et cetera.
11	And then section X.2.2.1 provides a
12	discussion on each one of those principles. So I'm
13	trying, I'm having a really hard time understanding
14	why any industry did not understand what the
15	fundamental design principles were. And that I
16	don't understand why you didn't tell them that.
17	Adding this reference to another NuScale DSRS where
18	they can go look it up is not very useful to them.
19	But you've got it throughout the document.
20	And you got the whole section on the
21	independence, redundancy, et cetera, et cetera, et
22	cetera, discuss in great detail what you mean by the
23	design principles. So I think you could have been
24	more pointed in your response. That's all.
25	MR. ASHCRAFT: Understood. And I guess we

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1	took the comment. I mean, obviously, they read the
2	DRG itself where we discussed all the I&C design
3	principles. But I guess it just seemed like they were
4	asking, like where did all this come from.
5	CHAIR BROWN: This is the best discussion
6	of all those design principles that's in any document
7	so far.
8	MR. ASHCRAFT: Right.
9	CHAIR BROWN: For the most part. I mean,
10	it's in the NuScale one and it's in the mPower to some
11	extent.
12	MR. ASHCRAFT: Yes.
13	CHAIR BROWN: Those were made better as
14	you all went along. But anyway, it's fairly clear how
15	it's defined. That's all. So I'm not objecting to
16	you all's disagreement, I just don't understand when
17	they say it's described in X.2.2.1. Is this the
18	intended definition? Well, my answer would have been
19	yes.
20	MR. ASHCRAFT: Right. Okay.
21	CHAIR BROWN: Anyway, you can go onto the
22	next one.
23	MR. ASHCRAFT: All right. Thank you.
24	CHAIR BROWN: That one's even better.
25	MR. ASHCRAFT: Right. So let's go to the
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58 next slide. Slide 12. So this was the comment, and 1 if you notice down in the bottom portion that's red, 2 3 those were the actual changes that they wanted made to 4 the DRG. 5 So our response was, so we partially agreed with the comments. Specifically, we added the 6 7 fundamental safety to the identified sentence as 8 proposed. However, the staff does not agree with 9 adding a reference to the IAEA technical report, as is 10 NEI 18-04, which is referenced in the DRG, includes and defines the term fundamental safety. 11 So a lot of their comments and, you know, 12 we provided, if there's any others you'd like to go 13 14 through. I mean, they were sort of in that sort of 15 vein. You know, we did make some minor revisions, but

16 overall, like I said up front, there was nothing major17 that needed to be changed in the DRG.

So let's go to slide -- well, I'll pause just for a minute.

CHAIR BROWN: Somebody else got a comment? 20 MEMBER BLEY: Charlie? 21 22 CHAIR BROWN: Yes, go ahead. It strikes me, what they 23 MEMBER BLEY: 24 saying is that this section isn't labeled were fundamental principles. It's labeled something else. 25

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1	MR. ASHCRAFT: You're back to Slide 11?
2	MEMBER BLEY: I'm back to the old one
3	because that hadn't jumped out at me, and after
4	Charlie's tirades, I went back and looked. And I
5	think their objection was you didn't title that whole
6	section fundamental principles, in which case they
7	would have known those were the fundamental
8	principles. That's all.
9	MR. ASHCRAFT: All right.
10	CHAIR BROWN: That's a good point. Thank
11	you, Dennis. I didn't think of that.
12	MR. ASHCRAFT: We'll take that observation
13	back.
14	CHAIR BROWN: It should be an easy one.
15	MR. ASHCRAFT: I wish that all your
16	observations were that easy.
17	CHAIR BROWN: Well, I've got more that
18	won't be easy.
19	MR. ASHCRAFT: All right. So let's go to
20	Slide 13.
21	CHAIR BROWN: Do you want my comments
22	before, or do you just want to cover your milestones
23	before I interrupt.
24	MR. ASHCRAFT: Well, we've got to
25	CHAIR BROWN: That slide.
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1	MR. ASHCRAFT: Well, the last slide is
2	questions. And I guess I should have put more
3	observations or comments, but yes, let's just finish
4	up with the milestones.
5	CHAIR BROWN: Okay. That's fine.
6	MR. ASHCRAFT: So I mean, this is just,
7	you know, we completed our public and ACRS
8	observations, and we're having our meeting,
9	subcommittee, today. We've got the full committee
10	scheduled in December sometime and we plan to
11	incorporate ACRS recommendations and prepare and issue
12	the final DRG sometime, you know, whether it's the
13	first quarter or the first part of 2021. We plan to
14	get it out as soon as possible after we, you know,
15	resolve the ACRS comments.
16	So I will go with that to the next slide.
17	So this, Charlie, Mr. Chairman Brown, is where you can
18	if you need to go back to some of the other slides,
19	that's fine too.
20	CHAIR BROWN: No, we probably don't have
21	to but you may need to have, hopefully, you've got
22	your document with you somewhere that you can look at
23	because I do have some detailed big issues that you
24	changed. One of them I missed from the June meeting,
25	and I apologize for that. But I'm going to bring it
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1	up now.
2	It's almost 11:00, do any members would
3	anybody like to take, before we dive into this, might
4	take a half an hour, 45 minutes or so, take a break
5	before we do that? I know Walt and I normally like to
6	take our breaks. I'm sorry to ping on you Walt.
7	MEMBER BLEY: Good idea, Charlie.
8	MEMBER KIRCHNER: That's a good idea,
9	Charlie. Ms. Lucy is looking at me like it's time.
10	CHAIR BROWN: I understand what Ms. Lucy
11	means.
12	(Simultaneous speaking.)
13	CHAIR BROWN: We'll take a, what time is
14	it? 11:00, 10:50? We've got some time so why don't
15	we take a break until 11:15. That way everybody can
16	let their dog out and everything, get another cup of
17	coffee, et cetera. Is that okay?
18	MR. ASHCRAFT: Yes.
19	CHAIR BROWN: 11:15 eastern standard time.
20	MR. ASHCRAFT: It's a deal.
21	CHAIR BROWN: Okay. We are recessed.
22	(Whereupon, the above-entitled matter went
23	off the record at 10:52 a.m. and resumed at 11:17
24	a.m.)
25	CHAIR BROWN: Okay. We're ready to
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1	reconvene. I think we are at the point of letting me
2	go through a few other well, before I do that, do
3	any of the other members have any other questions or
4	items they'd like to bring up? Before I launch into
5	one of my tirades, as Dennis so marvelously put it.
6	Hearing none, I will proceed on in.
7	If you look at your new DRG, and it's in
8	Section X.0.1.1, it's the third paragraph under Scope
9	of Review. The second sentence reads, well, I'll read
10	the first one. It says the type of application under
11	review largely determines the review activities to be
12	conducted and impacts the complexity and scope of the
13	review.
14	Then it goes on to say the scope and level
15	of detail for the I&C design should be the same for
16	operating licenses, combined licenses, and
17	manufacturing licenses, while less detail is an option
18	for design certifications, standard design approvals,
19	or construction permits.
20	And that's a change from the 6.2 review
21	version. It was made in response to an NEI 4.4-3. It
22	basically says that a new plant design certification,
23	that we've been doing for the last 12 years, the level
24	of detail does not have to be the same breadth or
25	depth that a replacement system in an operating plant
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1	would require.
2	When you go through the DRG, there's
3	emphasis placed on detailed architecture, so that the
4	print meets all the fundamental principles, and that's
5	highlighted in a number of other sections, like
6	Section 0.2, 0.1.1, you know, 1.2, and on and on.
7	I don't understand why design
8	certifications was moved out of the that whole
9	paragraph used to just read all six of those items in
10	a row, and then it was revised in this version to say,
11	to split them out, these three areas don't need
12	additional, they don't need the same level of detail
13	in their
14	MEMBER BLEY: Charlie? This is Dennis.
15	CHAIR BROWN: Yes.
16	MEMBER BLEY: Can I jump in before the
17	staff answers you?
18	CHAIR BROWN: Yes. Go ahead.
19	MEMBER BLEY: Well, the one thing I liked
20	about this is in the first half, it says operating
21	licenses, combined licenses.
22	CHAIR BROWN: Yes.
23	MEMBER BLEY: It says, to me, that the I&C
24	review at the COLA stage has to be very thorough.
25	It's not cursory at all.
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1	CHAIR BROWN: That's correct.
2	MEMBER BLEY: Which is, I like having that
3	here. But go ahead.
4	CHAIR BROWN: That was there in the
5	version we did back in June, also. All of those
6	items, the whole list
7	(Simultaneous speaking.)
8	MEMBER BLEY: here which means saying,
9	well, if your design cert isn't as complete as we'd
10	like, we're going to do a detailed review at the COLA
11	stage is what it says to me. And I like that.
12	CHAIR BROWN: Yes. But you know darn well
13	that when we do the design certification, it's
14	normally, we've had details. It used to that
15	whole, the thing that was added here was the while
16	less detail is an option for, instead of having the
17	whole string of six items.
18	And I can understand a thing like that
19	might not require having all the other details because
20	it's already done, theoretically. I guess you don't
21	have a construction permit until you've got a combined
22	operating license. Am I correct, or not? Do I get an
23	answer?
24	MR. ASHCRAFT: This is Joe Ashcraft. Ask
25	your question again. I'm sorry. I was trying to

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1	formulate an answer for the overall context. Well,
2	we're going to take note of what you're saying,
3	Chairman, and I don't I can't recall whether this
4	was part of maybe OGC's resolutions or not. But we'll
5	look at it and we'll get an answer. But now back to
6	your last question. Could you repeat it?
7	CHAIR BROWN: Well, there was an NEI 4-3
8	resolution, apparently contributed to this. At least
9	that's the way I've got it noted here. I might be
10	wrong. But irrelevant. That's really irrelevant. I
11	just kind of fundamentally don't like having the less
12	detail for design certifications in there in the
13	standard design approvals because we've, we just did
14	a standard design.
15	There was just a standard design approval,
16	I guess, reviewed for NuScale, I guess. I've
17	forgotten who it was for. Is that right? My memory's
18	a little foggy.
19	MEMBER REMPE: Yes, that's correct
20	Charlie.
21	CHAIR BROWN: Okay, and I believe we had
22	hardly anything at all associated with that. So that
23	was considerably less design detail.
24	MEMBER REMPE: Charlie, it was consistent
25	with what was in the design certification, right?

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1	CHAIR BROWN: That's the theory.
2	MEMBER REMPE: I mean, that was it was
3	kind of, they didn't do anything different for the SDA
4	than they did for the design certification.
5	CHAIR BROWN: That was my understanding.
6	But we did not go through and have them they did
7	not go through a great level of discussion on that in
8	terms of everything. So anyway, that's my comment.
9	I'll pass that on to you. Hopefully
10	MEMBER KIRCHNER: Charlie, this is Walt.
11	I'm with you on one point. Construction permit
12	harkens back to 10 C.F.R. 50, the old, the former two-
13	step process. And there, of course at a construction
14	permit stage, you didn't have quite the final level of
15	detail that you would have for the others.
16	CHAIR BROWN: Yes.
17	MEMBER KIRCHNER: Like the operating
18	license stage.
19	CHAIR BROWN: Yes.
20	MEMBER KIRCHNER: Or as we've seen in the
21	combined license.
22	CHAIR BROWN: Yes. Just obviously, like
23	Diablo Canyon, when they replaced their stuff, or we
24	did the review for that, we had a very good
25	understanding of their architecture. That's an

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1	operating plant. That's what I view as an operating
2	plant, an operating license, LAR type approach.
3	So anyway, that was the one comment. The
4	second one was
5	MR. HOELLMAN: Hey Chairman Brown, do you
6	mind if I jump in for a second?
7	CHAIR BROWN: No.
8	MR. HOELLMAN: Just to sort of provide, I
9	guess, I think our reasoning for saying less detail is
10	an option for design certification is there's the
11	option for a design to use the Design Acceptance
12	Criteria, or DAC, in design certification. And so if
13	an applicant chooses to do that, then that's sort of
14	where we were going with allowing it as an option for
15	less detail.
16	CHAIR BROWN: Okay. Let me, just to
17	backtrack, I think, Dennis correct me, I remember we
18	went through a lot of pains with DAC on AP1000.
19	MEMBER BLEY: Just a couple things,
20	Charlie. We did, and we actually got an SRN from the
21	Commission at that point saying we'd be involved in
22	the later booking a DAC because of that. This is now
23	saying, to me, that it meets what we were trying to
24	get, if you got DAC, or DAC master rating as ITAC,
25	which we run into a little bit.
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1	The review at the COLA stage has to fill
2	in any gaps that were there. And it's not an
3	inspection, it's a review.
4	(Simultaneous speaking.)
5	MEMBER BLEY: we were after back then.
6	So that's why I thought this was a good separation.
7	We haven't always had all the details, but we've
8	always been able, the staff's always been able to
9	review at the level of the fundamental principles,
10	which is why they were developed in the first place.
11	CHAIR BROWN: Well, that doesn't happen on
12	ESBWR. There was virtually no information on the
13	initial
13 14	initial (Simultaneous speaking.)
13 14 15	initial (Simultaneous speaking.) CHAIR BROWN: That was in 2008 in June, or
13 14 15 16	initial (Simultaneous speaking.) CHAIR BROWN: That was in 2008 in June, or July, or August. Something like that.
13 14 15 16 17	<pre>initial         (Simultaneous speaking.)         CHAIR BROWN: That was in 2008 in June, or     July, or August. Something like that.         MEMBER BLEY: But that's the history that</pre>
13 14 15 16 17 18	<pre>initial                   (Simultaneous speaking.)                  CHAIR BROWN: That was in 2008 in June, or             July, or August. Something like that.                  MEMBER BLEY: But that's the history that             led to it.</pre>
13 14 15 16 17 18 19	<pre>initial</pre>
13 14 15 16 17 18 19 20	<pre>initial         (Simultaneous speaking.)         CHAIR BROWN: That was in 2008 in June, or     July, or August. Something like that.         MEMBER BLEY: But that's the history that     led to it.         CHAIR BROWN: Yes. That's why we started     this whole framework that led to making sure we had</pre>
13 14 15 16 17 18 19 20 21	<pre>initial         (Simultaneous speaking.)         CHAIR BROWN: That was in 2008 in June, or July, or August. Something like that.         MEMBER BLEY: But that's the history that led to it.         CHAIR BROWN: Yes. That's why we started this whole framework that led to making sure we had detailed architecture with that. It took two years</pre>
13 14 15 16 17 18 19 20 21 22	<pre>initial                             (Simultaneous speaking.)</pre>
13 14 15 16 17 18 19 20 21 22 23	<pre>initial         (Simultaneous speaking.)         CHAIR BROWN: That was in 2008 in June, or July, or August. Something like that.         MEMBER BLEY: But that's the history that led to it.         CHAIR BROWN: Yes. That's why we started this whole framework that led to making sure we had detailed architecture with that. It took two years before we had enough information. AP1000 was a lot better, and we still had to wrestle with a few issues.</pre>
13 14 15 16 17 18 19 20 21 22 23 24	<pre>initial</pre>
13 14 15 16 17 18 19 20 21 22 23 24 25	<pre>initial     (Simultaneous speaking.)     CHAIR BROWN: That was in 2008 in June, or July, or August. Something like that.     MEMBER BLEY: But that's the history that led to it.     CHAIR BROWN: Yes. That's why we started this whole framework that led to making sure we had detailed architecture with that. It took two years before we had enough information. AP1000 was a lot better, and we still had to wrestle with a few issues. And then AP1400, or APR1400 and NuScale sailed through because they recognized that's what we were looking</pre>

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1	for, and we got very, very good DCDs and good
2	architecture presentations. So those were really
3	simple.
4	I'm just concerned that we're going to
5	lose what we've gained over the last 12 years in terms
6	of being able to make sure that we had a suitable
7	architecture for the plant.
8	MR. ASHCRAFT: Yes, Charlie. This is Joe
9	Ashcraft. We'll take note of that and get back to
10	you.
11	CHAIR BROWN: Okay. You'll get a copy of
12	my comment.
13	MR. ASHCRAFT: Okay. Good.
14	CHAIR BROWN: Okay. The second item was,
15	and I may have covered this if I can find it again.
16	It was in 01.2, Item 6, was where you introduced the
17	unidirectional communications. Oh, I think I covered
18	that. It ought to be covered in the actual appendix
19	also. I think I covered that one already.
20	MR. ASHCRAFT: Yes.
21	CHAIR BROWN: Okay. We'll go onto the
22	next one which was in Section 2.2.1.3, Review
23	Procedures, Item 8, and that is 2.2.1.3, that was
24	under diversity and defense-in-depth to address CCFs,
25	unless I've messed that up. No, Item 8, excuse me.

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1	Yes. Item 8.
2	MEMBER BLEY: Charlie, what was the number
3	again?
4	CHAIR BROWN: It was Section 2.2.1.3.
5	MEMBER BLEY: Three, okay.
6	CHAIR BROWN: That's diversity, defense-
7	in-depth, I believe. And it's under the review
8	procedures. And it's line Item 8. There used to be,
9	in the initial version of this we reviewed, there are
10	now two new ones, Item 8 previously read provision of
11	a set of displays and controls located in the main
12	control room for manual system level actuation, et
13	cetera, et cetera.
14	And the revision deleted located in main
15	control. And that the reason was given, that was
16	an NEI comment 4-46, which stated that some advance
17	reactors may not have a traditional control room. And
18	therefore, they substituted the words controls
19	accessible to operators for manual system controls.
20	And I have accessible has no definition
21	and I'm not, you know, I was going to be proposing
22	that you modify that again and say retain the located
23	in the main control room. Yes. Revise located in the
24	main control room or accessible to operators in a
25	timely manner, based on a human factors engineering

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1	analysis.			
2	So you get your point, but we put some			
3	meat on it. But we retain main control. I have a			
4	hard time thinking no main control room. So deleting			
5	all reference from main control room in this document			
6	seems to be the wrong way to go, or not a good way to			
7	go. So that's my comment. You'll get that also in			
8	writing.			
9	MR. ASHCRAFT: Noted.			
10	CHAIR BROWN: Okay.			
11	MEMBER KIRCHNER: Charlie?			
12	CHAIR BROWN: Yes.			
13	MEMBER KIRCHNER: This is Walt.			
14	CHAIR BROWN: Yes.			
15	MEMBER KIRCHNER: Unaccessible, as you			
16	said, that needs it begs a definition. I'm doing			
17	this from memory and I don't have the GDCs in front of			
18	me but isn't it GDC 18 that requires protection for			
19	the operators to conduct their business, essentially?			
20	That, to me, is the accessible definition.			
21	Some variation on that, whether it's in one of their			
22	PDCs or it would seem to be, you have to provide for			
23	protection of the operators.			
24	CHAIR BROWN: Yes. I don't know all the			
25	GDCs by heart. Not like some of you do.			

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MEMBER KIRCHNER: Anyway, I'm just -- just a pointer when thinking about what accessible means. There is that GDC about habitability of the control room. If there's no control room, it begs the question where are these functions executed. But then it would also beg the question, is that a habitable accessible area?

8 Charlie suggested some words. We don't 9 want to rewrite this for them. But you know, 10 something like safely and easily accessible to the 11 operators might get that point across. But the staff 12 ought to be able to come up with something.

CHAIR BROWN: Yes, well I've given the 13 14 suggestion and let's see how they resolve it. I just 15 think you need a human factors evaluation of that 16 tossed into it. Ιf you're qoinq to make it 17 accessible, the only way you can kind of evaluate that is, I agree with Walt, is to figure out somebody do an 18 19 analysis, and that it meets the accessible routine based on somebody looking at some real human factors 20 considerations. 21

MR. ASHCRAFT: Yes. This is Joe Ashcraft. So a lot of that, I'll just say, is from GDC 19, but keep in mind, there's PDCs and I'd have to go back to look at the wording to see how that modified it,

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1	potentially, or could modify it potentially.	
2	But we note it, and	
3	CHAIR BROWN: Okay. That's all I'm trying	
4	to do is get these to you so you can try to do what	
5	you're going to do before the full committee meeting,	
6	and let us know what you're going to do so we can	
7	discuss it at the full committee meeting.	
8	MR. ASHCRAFT: Understood. Thanks.	
9	CHAIR BROWN: Thanks. I want the loose	
10	ends to be able to be discussed at the full committee	
11	meeting. That's why I'm bringing them up in this	
12	detail.	
13	MR. ASHCRAFT: Understood.	
14	CHAIR BROWN: Then the next item was, I	
15	think I've covered. You can confirm. It's 2.2.1.4.	
16	That's predictable and repeatable behavior. And there	
17	was a, in Appendix A, A-9, there's a sentence like	
18	logic processing units are monitored by an independent	
19	hardware based, the washed out timer comment that you	
20	all put in in Appendix A-9.	
21	MR. ASHCRAFT: Yes.	
22	CHAIR BROWN: And I thought that should be	
23	reflected as an additional item in the review	
24	procedures listing in that 2.2.1.4. And you'll see	
25	that in the comments I send.	
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1	MR. ASHCRAFT: And that's where you're			
2	talking about a pointer or something.			
3	CHAIR BROWN: A what?			
4	MR. ASHCRAFT: A pointer to that A-9.			
5	CHAIR BROWN: You can do it that way also.			
6	That's fine. I'm not, I don't object. We don't have			
7	to just repeat stuff, but a pointer to A-9 would be			
8	okay.			
9	MR. ASHCRAFT: Understood.			
10	CHAIR BROWN: As far as I'm concerned.			
11	But it's a separate item.			
12	MR. ASHCRAFT: Understood.			
13	CHAIR BROWN: So the next one is in			
14	Appendix A, Item A-8. It's in a lead in in Item 1.			
15	Let me I got to go back and find that now.			
16	MEMBER BLEY: Page 32, Charlie.			
17	CHAIR BROWN: Well it depends on which			
18	document you're looking at.			
19	MEMBER BLEY: Within a page of 32.			
20	CHAIR BROWN: Yes. Mine's on 33. It's			
21	multi-unit stations. And this is the one I missed in			
22	the 6/2, in our June 2nd subcommittee review. I had			
23	reviewed, before that subcommittee, an earlier			
24	revision of the DRG, an earlier version. I think it			
25	was a March or April version.			

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And then the N.O.O version came down and that modified that section, and I missed it. But an earlier version, it stated -- which part is this. Right at the beginning. Right now it says since SSCs can be shared, the old version said while SSCs can be shared among NPP units of multi-unit stations, the reviewer should confirm that safety related systems are not shared. Safety related I&C systems are not 9 shared among NPP units.

Okay, the new wording, since SSCs can be 10 shared, the reviewer should confirm, and the first 11 item says, safety related I&C SSCs are not shared 12 among NPP units unless it can be shown that such 13 14 sharing will not significantly impair their ability to perform their safety functions, including in the event 15 of an accident in one unit, an orderly shutdown and 16 cool down of the remaining units. 17

And I'm trying to -- I don't like shared 18 19 stuff if you can -- well, I can't imagine a safety system in Unit 1 being shared with eight other units, 20 or six other units, or whatever. All combined. In 21 what what's 22 other words, does, the meaning of significantly impaired? That means you can impair it 23 Just one function. 24 a little bit? Two or three functions are okay. 25

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1	Item 2, it's also then, if you look at	
2	Item 2 in that listing, it says I&C design	
3	descriptions in the application provide assurance that	
4	safety related I&C SSCs are not share among units. So	
5	the first item says they can be, as long as they don't	
6	impair, and the second one says don't. So there's a	
7	big inconsistency there, as well as just an	
8	unsatisfactory approach in Item 1, in my opinion.	
9	MR. ASHCRAFT: Understood.	
10	CHAIR BROWN: I think we ought to, we	
11	ought to be subject, you really ought to get rid of	
12	this idea that you cannot significantly impair stuff.	
13	That's the way I would it ought to just go back to	
14	the way it read before. So that's that comment.	
15	MEMBER BLEY: Well, let's there's a lot	
16	of complications there and before the staff jumps on	
17	what Charlie's suggesting, I'm wondering, have you	
18	thought about this in more sorts of things. I could	
19	imagine safety related electric power being shared	
20	among modules in a multi-module system. I'm not sure	
21	what else might be.	
22	You know, we reviewed the design recently.	
23	It's multi-modular. But because of uniqueness in	
24	their design, the safety system and a limited	
25	number of safety systems, they weren't shared because	
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1	they all fit kind of within each module package. So	
2	I'm not sure, it makes sense to jump off and say they	
3	can't be shared anywhere. Has the staff thought about	
4	this in any detail?	
5	CHAIR BROWN: These are I&C designs, not	
6	the electric plans. This says I&C design, safety	
7	related I&C SSCs, not electric plans. So I understand	
8	your point, Dennis from that standpoint. Because I	
9	thought we did have some shared systems on NuScale.	
10	MEMBER BLEY: I'm not sure we had shared	
11	safety systems. I have to go back and look more	
12	carefully.	
13	CHAIR BROWN: Oh, the I&C system	
14	(Simultaneous speaking.)	
15	MEMBER BLEY: think about what kind of	
16	I&C systems people may want to share and how they	
17	define what's safety related. I don't know. I'd like	
18	the staff to tell us a little bit about what led to	
19	that and what kind of sharing their imagining would be	
20	okay.	
21	(Simultaneous speaking.)	
22	MEMBER BLEY: Because off the top, I agree	
23	with Charlie, but off the top is no way to do this	
24	sort of thing.	
25	MR. ASHCRAFT: Well if you, I guess we	
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1	pulled a lot of these words from appendix, I mean 10			
2	C.F.R. part 50 Appendix A, Criteria 5, where it talks			
3	about sharing of structure systems and components. So			
4	I think that's sort of what brought us to these words.			
5	But we'll take note of it.			
6	MEMBER BLEY: At the full committee, maybe			
7	you can tell us what you're thinking about it if you			
8	decide to keep words like this. Because I haven't			
9	thought about it in any detail			
10	MR. ASHCRAFT: Right. Understood. Good			
11	comments.			
12	CHAIR BROWN: Normally when I think of			
13	safety related I&C systems, I normally think reactor			
14	trip and safeguard systems. Okay? There may be other			
15	systems.			
16	MEMBER BLEY: You know, it's kind of clear			
17	there will be one for each unit, but there's other I&C			
18	systems and I'm not sure exactly which ones are tagged			
19	safety related and which ones aren't. And how they're			
20	even tagged that way because if you're going to try to			
21	be consistent with licensing modernization, that would			
22	have an effect on that issue.			
23	CHAIR BROWN: Well I always considered rod			
24	control systems safety related I&C systems in my			
25	plants. But in here, in the commercial world, they			
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1	are not safety related.			
2	MEMBER BLEY: I guess at the full			
3	committee meeting, I'd like to hear from the staff on			
4	this one.			
5	CHAIR BROWN: Oh, that's fine. That's the			
6	purpose of bringing it up.			
7	MR. ASHCRAFT: And your comment about this			
8	is I&C, I mean, this Appendix A is a IEEE 603			
9	criteria, which is not just specific to I&C. But			
10	we'll take a look at the words and we'll provide			
11	examples or, you know, have a discussion, or make			
12	changes as necessary.			
13	CHAIR BROWN: Well the second, Item 2, is			
14	a direct, it's contradictory.			
15	MR. ASHCRAFT: Yes. Understood.			
16	CHAIR BROWN: Okay. So we've got to have			
17	some resolution that doesn't have a conflict in it.			
18	MR. ASHCRAFT: Understood.			
19	CHAIR BROWN: Okay. And the last one, I			
20	may have covered. That's the automatic and manual			
21	control, that's A-9. And it was under manual control.			
22	It was, oh, that was the diverse software based			
23	digital equipment to perform coordinated actuation			
24	logic.			
25	And my recommendation would be, and you'll			

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1	see it in my comments, is to change the diverse			
2	software to discrete hardware wired logic components,			
3	which integrated circuit, you know, logic units that			
4	are both fundamentally hardware. They are, they're			
5	not microprocessors. You program them and that's			
6	they're on and off, yes or no logic. The way we used			
7	to build analog computers.			
8	MR. ASHCRAFT: Understood.			
9	CHAIR BROWN: So that's the last of my			
10	miscellaneous comments. I fundamentally don't think			
11	we ought to be, you know, introducing software back			
12	into the manual actuation function, particularly when			
13	it's going to be probably a single task after your			
14	initial manual control.			
15	And the priority and logics that were used			
16	in NuScale, used hardware based logic units,			
17	integrated circuits. So that was it for me. And			
18	Christina will email this to you later in the week,			
19	after I send it to her. Do any other members have any			
20	additional comments?			
21	Hearing none, I will Christina, can you			
22	check to see if the phone line is open?			
23	MS. ANTONESCU: Yes. Thomas, would you			
24	please open the bridge line? Thomas, I'm sorry. You			
25	said on?			

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1	MR. DASHIELL: Yes. It is on.			
2	MS. ANTONESCU: Thank you very much.			
3	CHAIR BROWN: Okay. Thank you, Christina			
4	and Thomas. Is there anyone on the bridge line, the			
5	public line, that would like to make a comment? Is			
6	NEI on that line, Christina?			
7	MS. ANTONESCU: I believe so. Steve			
8	Vaughn also is on the line.			
9	CHAIR BROWN: Is he on a dedicated line?			
10	MS. ANTONESCU: He's on the bridge line.			
11	CHAIR BROWN: Oh, okay. Steve, are you			
12	there?			
13	MS. ANTONESCU: He was.			
14	CHAIR BROWN: Okay. Is somebody back			
15	again? I'm going to give it a few more seconds. I			
16	heard a mute off come up. Is he still showing as a			
17	participant, Christina?			
18	MS. ANTONESCU: He's on the bridge line,			
19	so he wouldn't show as a participant.			
20	CHAIR BROWN: Oh, okay. Well mute is off.			
21	So is anybody else on the bridge line that would like			
22	to make a comment? Christina, am I back?			
23	MS. ANTONESCU: Yes, you are.			
24	CHAIR BROWN: Okay. My computer just put			
25	me off. I just logged back in. Okay, well, I don't			

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1	hear anything on the bridge line. You can ask Thomas			
2	to close the bridge line.			
3	MR. DASHIELL: Closing the bridge line.			
4	CHAIR BROWN: And if there is any more, or			
5	one last round for the members. Does anybody else			
6	like to make any additional comment?			
7	MR. HECHT: Charlie, this is Myron.			
8	CHAIR BROWN: Oh, yes.			
9	MR. HECHT: I just wanted to let you know			
10	that I actually was not able to respond here when you			
11	asked at the beginning of the meeting.			
12	CHAIR BROWN: Oh, okay.			
13	MR. HECHT: Because I didn't press Star 6,			
14	I just wanted to let you know that.			
15	CHAIR BROWN: Okay. All right. Thank			
16	you, Myron. Okay. With that, if there's no other			
17	comments, we will adjourn the meeting. Staff, I			
18	presume you will I will send these comments to you			
19	and you'll be able to go through your resolution,			
20	hopefully tell us what you plan to do before the			
21	meeting so we can look at them.			
22	MR. ASHCRAFT: Understood. Thank you ACRS			
23	committee members for your comments, I mean			
24	observations. I'm sorry.			
25	CHAIR BROWN: And thank you very much for			
1	I Contraction of the second			

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1	the presentations today. I think we had some good		
2	interchanges. I look forward to the full committee		
3	meeting and we will be writing a letter unless my		
4	members tell me that they don't want me to, which I		
5	don't anticipate that, unfortunately. So the meeting		
6	is now adjourned.		
7	(Whereupon, the above-entitled matter went		
8	off the record at 11:48 a.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 (ACRS) Subcommittee Meeting October 21, 2020





- Introduction
- Overview of instrumentation and controls (I&C) DRG to support the NRC staff's safety evaluation of advanced reactor applications
- Fundamental I&C Design Principles
- Overview of revisions to the DRG to address ACRS observations and public comments



# **Licensing Modernization Project**



- Licensing Basis Events
- Classification of Structures, Systems, and Components (SSCs)
  Defense-in-Depth (DID)





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





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

Safety-focused

Risk-informed

Performance-based

Technology-Inclusive

- Supports the NRC's vision and strategy for advanced reactor safety reviews
- Incorporates principles from Regulatory Guide (RG)-1.233



#### **I&C System Review Framework**





### **Overall Review Approach**

- The NRC 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-Significant Functions

Architecture

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

Functions Not Safety-Significant

- The design-related review for SSCs that the NRC staff determined are not safety-related and not risk significant should be less
- The NRC staff review focuses on ensuring that failure or operation of such SSCs will not prevent other SSCs from performing their safetysignificant functions or adversely affect DID adequacy



**4 Principles plus Simplicity** 





• Control of Access, Section X.0.1.2, Item 6

The review should confirm that hardware characteristics that enforce unidirectional communication feature(s) (e.g., the use of a unidirectional/non-software based link that is connected only to a transmitter in the higher classified system and a receiver in the lower classified system) are considered by the applicant as the preferred means for mitigating any hazard(s) associated with communication paths.



• Manual Controls, Appendix A, A.9

The manual controls provided in the I&C design should be connected downstream of the plant's digital I&C safety system outputs. These connections should not compromise the integrity of interconnecting cables and interfaces between local electrical or electronic cabinets and the plant's electromechanical equipment. The manual controls may be connected either to discrete hardwired components or to simple, dedicated, and diverse software-based digital equipment that performs the coordinated actuation logic.



## Resolution of Public Comments Example 1

### Comment No. 4-7

The term "fundamental I&C design principles" is used throughout the document. It appears that these may be described in Section X.2.2.1. Is this intended as a definition?

Clarify where the definition of "fundamental I&C design principles" exists and explain the relationship between fundamental I&C design principles and PDCs.



## Resolution of Public Comments Example 2

# Comment No. 4-13

The guide states: "The objectives of I&C system reviews are to confirm that: (1) the I&C system design includes the functions necessary to assure adequate safety during operation of a NPP under normal operation, transient, and accident conditions; ..."

The statement refers to "functions" in the context of a finding of adequate safety. The statement is not specific as to the type of functions that are part of an adequate protection finding.

In the NEI 18-04 context, fundamental safety functions are those that are important to a finding of adequate protection. Recommend rewording item (1) as follows:

... "(1) the I&C system design addresses the fundamental safety functions as stated in "Proposal for a Technology-Neutral Safety Approach for New Reactor Designs," Technical Report IAEA-TECDOC-1570, to assure adequate safety during operation of a NPP under normal operation, transient, and accident conditions; ..."



#### Schedule Milestones

	Activity	Completion Date
A.1	Addressing public/ACRS comments	COMPLETE
A.2	2 <sup>nd</sup> DRG ACRS Sub-Committee meeting	October 21, 2020
A.3	DRG ACRS Full Committee meeting	December 2020
A.4	Incorporate ACRS recommendations and prepare final DRG	1st Quarter 2021





# 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
- RG Regulatory Guide
- SMR small modular reactor
- SRM staff requirements
   memorandum
- SSCs structures, systems, and components
- Std standard
- TICAP technology-inclusive content of application project



# **Backup Slides**



## **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





#### **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







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

