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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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DIGITAL I&C SUBCOMMITTEE

+ + + + +

THURSDAY

FEBRUARY 22, 2024

+ + + + +

The Subcommittee met via Videoconference,
at 1:00 p.m. EST, Charles H. Brown, Jr., Chair,
presiding.

COMMITTEE MEMBERS:

CHARLES H. BROWN, JR., Chair

RONALD G. BALLINGER, Member

VICKI M. BIER, Member

VESNA B. DIMITRIJEVIC, Member

GREGORY H. HALNON, Member

JOSE A. MARCH-LEUBA, Member

ROBERT P. MARTIN, Member

DAVID A. PETTI, Member

WALTER L. KIRCHNER, Member

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THOMAS E. ROBERTS, Member

MATTHEW W. SUNSERI, Member

ACRS CONSULTANTS:

DENNIS BLEY

MYRON HECHT

STEPHEN SCHULTZ

DESIGNATED FEDERAL OFFICIAL:

CHRISTINA ANTONESCU

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

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

1:10 p.m.

CHAIR BROWN: Well, good afternoon, everyone. This is a meeting of the Digital I&C Subcommittee. We will now come to order.

I'm Charles Brown, Chairman of this subcommittee meeting. ACRS members in attendance are Tom Roberts, Greg Halnon, Matt Sunseri, Jose March-Leuba, Vesna Dimitrijevic, Ron Ballinger, Dave Petti, Walk Kirchner, Vicki Bier, and Robert Martin. Myron Hecht, and Stephen Schultz are consultants are also online. Oh, is Dennis here? Thank you, Dennis. Say hello, Dennis.

DR. BLEY: Hello, Dennis.

CHAIR BROWN: Okay. Thank you. Christina Antonescu of the ACRS staff is the Designated Federal Official for this meeting. The recorder is on, Christina? Okay, thank you. The purpose of this meeting is for the staff to provide a briefing on the draft final revision, Branch Technical Position 7-19, Guidance for Evaluation of Defense in Depth and Diversity to Address Common Cause Failures Due to Latent Design Defects in Digital I&C Systems.

Specifically, the staff will discuss clarifications made throughout the BTP to address

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1 discussions in our previous meeting in September of
2 last year, public comments that have been received
3 over the last five or six months, and comments from
4 members in the previous meeting. The ACRS -- a lot of
5 these comments, this is also derived from the new SECY
6 22-0076 for which the Commission has provided the
7 staff requirements memorandum to the staff on the
8 subject of that SECY. The ACRS was established by
9 statute and is governed by the Federal Advisory
10 Committee Act, FACA.

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

16 That said, we have set aside 15 minutes
17 for comments from members of the public or listening
18 to our meeting subsequent to our conclusion of the
19 brief and discussions. Written comments are also
20 welcome. Just a little reminder on this relative to,
21 we speak through our letters.

22 There are plenty of comments by members,
23 both here in the room as well as online. Personal
24 comments, they do not reflect an overall advisory
25 committee agreement with nor disagreement with that

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1 would only be resolved through our formal letter
2 following a full committee meeting. Written comments
3 are also welcome.

4 The meeting agenda for today's meeting was
5 published on the NRC's public meeting notice website
6 as well as the ACRS meeting website. On the agenda
7 for this meeting and on the ACRS meeting website are
8 instructions as to how the public may participate. No
9 request for making statements of the subcommittee has
10 been received for the public.

11 We are conducted today as a hybrid
12 meeting. A transcript of the meeting is being kept
13 and will be made available on our website. Therefore,
14 we request that participants in this meeting should
15 first identify themselves and speak with sufficient
16 clarity and volume so that they can be readily heard.

17 All present presenters please pause from
18 time to time to allow members to ask questions.
19 Please indicate the slide number you are on when
20 moving to the next slide. I presume you will probably
21 not have any problem with the members interrupting you
22 and knowing when they want to ask a question.

23 So if you miss something, just raise your
24 hand. We have the MST phone line audio only
25 established to the public to listen to the meeting.

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1 I'd like to remind the public that they are to listen
2 during this part of the meeting and comments should be
3 reserved for the public comment session at the end of
4 the meeting.

5 Based on our experience from previous
6 virtual and hybrid meetings, I would like to remind
7 the speakers and presenters to speak slowly. We will
8 take a short break after each presentation to allow
9 time for screen sharing as well as the chairman's
10 discretion during longer presentations. Lastly,
11 please do not use any virtual meeting feature to
12 conduct sidebar technical discussions.

13 Rather, contact the DFO if you have any
14 technical questions so we can bring those to the
15 floor. We will now proceed with the meeting, and I
16 will -- I guess, first of all, I'm going to ask Mr.
17 Jason Paige, the branch chief for the Long Term
18 Operations and Modernization Branch, Division of
19 Engineering and External Hazards, in the Office of
20 Nuclear Reactor Regulation for any opening comments
21 from the staff. Jason, I'll give it to you first.

22 MR. PAIGE: All right. Thank you. So as
23 Member Brown said --

24 CHAIR BROWN: Get very close to the mic.
25 They have a very short range.

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1 MR. PAIGE: Can you hear me?

2 CHAIR BROWN: Now that's better, yeah.

3 MR. PAIGE: Okay.

4 CHAIR BROWN: Just don't eat the mic.
5 That's all.

6 MR. PAIGE: I'll try not to. My name is
7 Jason Paige. I'm the branch chief of the Long Term
8 Operations and Modernization Branch. And my branch is
9 responsible for implementing the Commission direction
10 in SRM SECY 22-0076 when expanding the use of risk
11 informed approaches in addressing visual I&C, common
12 cause failures, or CCF.

13 First, just want to thank you for this
14 opportunity to present to you the staff's implementing
15 guidance which is being incorporated in branch
16 technical position or BTP 7-19. This has been a
17 collaborative effort led by our I&C and risk staff in
18 NRR with support from the I&C staff and research. As
19 an update from our last briefing to the ACRS on this
20 topic back in September 2023, the staff incorporated
21 in the draft BTP some of the feedback held during that
22 briefing as well as some of the comments provided in
23 an attachment to the briefing transcript.

24 In addition, we issued the draft BTP 7-19
25 Revision 9 for public comment in October 2023. And

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1 the comment period closed in November 2023. During
2 today's briefing, the staff will summarize the changes
3 to the BTP to address the public comments in the
4 committee member discussions and feedback.

5 In preparation for today's meeting, the
6 staff provided the committee with a markup of the BTP,
7 the responses to public comments, and the responses to
8 the members' comments provided in an attachment to the
9 transcript. As a note, the BTP and public comment
10 response table are still under internal review and
11 changes may be made. We will inform the committee of
12 any major changes prior to issuance of the final
13 document.

14 The Commission direction gave the staff
15 one year to develop and complete the implementing
16 guidance. And we appreciate the committee's
17 flexibility on this issue. A full committee briefing
18 is currently scheduled for March 6, and we very much
19 appreciate getting the committee's letter feedback as
20 soon as possible to incorporate into the BTP to meet
21 our one-year deadline.

22 Before I turn the presentation over to the
23 staff, I would like to clarify a discussion that we
24 had during the September 2023 ACRS briefing regarding
25 the staff's approach for implementing the expanded CCF

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1 policy. On November 1st, 2023, the staff provided the
2 Commission an annual update on activities to modernize
3 the agency's instrumentation and controls regulatory
4 infrastructure which included the staff's approach for
5 addressing the Commission's direction of developing
6 guidance that is technology inclusive and applies to
7 all reactor types. In summary for light water
8 reactors, the staff is updated BTP 7-19 which is an
9 appendix to NUREG-0800 or the standard review plan or
10 SRP.

11 As indicated in NUREG-0800, the scope of
12 the SRP guidance applies to light water reactors. For
13 Digital I&C reviews for advanced non-light water
14 reactors, the staff relies on the licensing
15 modernization project which is endorsed by Reg Guide
16 1.233 and the desire review guide or DRG. While the
17 language used in the DRG does not clearly connect to
18 the revisions of the four points in the SRM, the
19 language does not preclude the reviewers from
20 considering alternative approaches which we believe
21 meets the intent of the Commission direction --

22 (Simultaneous speaking.)

23 CHAIR BROWN: Could you repeat that last
24 part on the DRG?

25 MR. PAIGE: Regarding the language?

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1 CHAIR BROWN: You started to talk about
2 the DRG.

3 MR. PAIGE: Yeah, so --

4 CHAIR BROWN: My brain was still on the
5 1.233.

6 MR. PAIGE: Okay, yes. The language in
7 the DRG, the DRG hasn't been updated since the
8 Commission provided the direction to the staff. So
9 there isn't any specific tie to the four points that
10 are in the draft BTP. But we think that the language
11 does not preclude the reviewers from considering
12 alternative approaches which we believe meets the
13 intent of the Commission direction or policy.

14 However, the staff will use pre-
15 application engagements to discuss the expanded policy
16 with non-light water reactor applicants to address any
17 questions or concerns. In addition, the staff will
18 continue to communicate the Commission's expanded CCF
19 policy to stakeholders during ongoing advanced reactor
20 I&C public workshops. The next workshop is scheduled
21 on March 14, 2024.

22 From our engagements and any lessons
23 learned identified, the staff will ensure that future
24 revisions of Reg Guide 1.233 in the DRG reflect any
25 additional clarifications for implementing the SRM and

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1 any further improvements that are determined to be
2 appropriate based on feedback from our stakeholders.
3 The staff believes that this approach is necessary to
4 understand what guidance on these matters would be
5 used to non-light water reactor applicants. And if
6 there's any questions that you have regarding our
7 approach, we do have staff of the DRG and the LMP that
8 are participating virtually. So that concludes my
9 opening remarks. I'll turn it back over to you,
10 Member Brown.

11 DR. BLEY: Charlie, can I sneak in a
12 question? This is Dennis Bley.

13 CHAIR BROWN: Fire away. I'll go after
14 you.

15 DR. BLEY: Well, it's probably the same
16 thing. In your responses to comments, you had
17 responses to comments by Charlie and Tom Roberts. Let
18 me ask about including RG 1.233 as a reference here.

19 And the staff responded that this only
20 applies to light water reactors (audio interference).
21 The discussion now was pretty interesting. But it
22 would seem at least reasonable to put some note in
23 here about what non-LWR people ought to do and what
24 Reg Guide 1.233 (audio interference).

25 MR. PAIGE: So I'm going to assume that's

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1 a question for me. So --

2 CHAIR BROWN: Yes. Hold on just a minute.

3 MR. PAIGE: Okay.

4 CHAIR BROWN: Tom would like to make a --1

5 MEMBER ROBERTS: I think probably
6 consistent with what Dennis was saying. Hey, two
7 questions that I thought we're probably were just
8 teeing up now and then either answering during the
9 presentation or at the end regarding what you just
10 talked about. The first one, is there anything from
11 the public feedback or from the ACRS feedback that
12 made you think about how that applied to the DRG or
13 how that applied to your ongoing discussions with
14 various applicants for how to apply some of the
15 principles that are in the DRG or in the BTP?

16 Again, probably best to answer that during
17 the presentation when the staff talks about the
18 various comments and what they do in the BTP. And the
19 second question is understanding your longer term
20 vision, presumably you don't want to always have a DRG
21 and a BTP because you got basically the same I&C
22 system is being developed by applicants and being
23 reviewed by the same cadre of folks here. And so I
24 was thinking you want to have some more signaling off
25 of the guidance. I was wondering what your near and

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1 long-term vision was to get there. Again, both of
2 those are probably better discussed after we do the
3 presentation and get a better sense of what's in the
4 BTP.

5 MR. PAIGE: So in terms of the approach,
6 I'll just provide an initial response. And like you
7 said, I'm sure we'll get into more details during the
8 staff's presentation. But in terms of having two
9 separate documents, as you're aware, the SRM, we had
10 one year to complete the implementing guidance.

11 So we thought this was the best approach
12 to develop guidance that's applicable to the different
13 stakeholders, external stakeholders. So we thought it
14 was useful to update the BTP to provide that avenue
15 for light water reactors. And then for the DRG
16 because that guidance is available for non-light water
17 reactors. And we also believe that DRG is already
18 risk informed technology inclusive. So we thought it
19 was best for us to get additional feedback from those
20 external stakeholders so that we can better understand
21 their needs and then proceed with updating the DRG
22 based off of those lessons learned.

23 CHAIR BROWN: Can I comment? From what I
24 understand and correct me if I'm incorrect, but the
25 BTP is fundamentally a review document for the staff

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1 whereas the DRG is what I call a general compendium
2 that consolidates all of the design concept type stuff
3 that should be considered during a -- for a licensee
4 to deal with as opposed -- well, not as opposed to.
5 But make sure it's clear relative to architectures and
6 how it's configured and communications, et cetera, et
7 cetera.

8 So I'm not quite sure I agree that it's
9 okay to delete the branch technical position because
10 we're not after reading it again for about the seventh
11 time in 16 years. It is pretty much general and not
12 explicitly. But it gives ideas to the licensees that,
13 hey, this is what the staff is going to be expecting.

14 And when first got here 16 years ago, the
15 first meeting I sat in on, on a -- I think it was
16 ESBWR or something like that. The presentation and
17 the staff response, while it was presented to us at a
18 subcommittee meeting was I don't want to use the word
19 unsatisfactory but not very illuminating because it
20 was just not an understanding at all from the licensee
21 knowing what the staff really was looking for when
22 they came in for their application. So I don't want
23 to lose that connection.

24 With that thought in mind, there's also an
25 ISG-6 which is a beginning licensing process review

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1 for the licensees. And so from the design side, you
2 want to make sure they're addressing the design
3 concepts that you expect to see, whether they're
4 different than what you have in the reg guides or not.
5 But you still want them to know what you're expecting.

6 And the branch technical position on
7 defense in depth will always be relevant regardless
8 how safe you think a non-light water reactor is that
9 we won't have that discussion today. But it provides
10 acceptance criteria for the various areas that the
11 defense in depth is expecting to be addressed. And
12 that's not in the design review guide.

13 In trying to pump all that information,
14 staff review stuff into the design review guide is --
15 personal opinion again, this is me, is not really the
16 best approach. You need some separation so that the
17 vendors -- the licensees have some idea of how they
18 should proceed in the beginning. So I'm just saying
19 that now because two months, I won't be a member.

20 I can say that now with some confidence,
21 and it's based on experience. The ISG-6 did not exist
22 when I first got here. And it was developed to try to
23 eliminate in the presentation because the designers
24 did not know what the staff wanted and what depth we
25 wanted to see stuff -- staff and the committee.

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1 So I'd like to just make that observation
2 as a secondary observation on what you guys do.
3 Hopefully Member Roberts will keep you guys in tow.
4 Go ahead.

5 MEMBER ROBERTS: Yeah, I think waiting
6 until the end is probably the best approach. But just
7 to give you some sense of what I'm thinking, you've
8 got common cause failure guidance in IEEE standards.
9 You've got common cause failure guidance in a BTP.

10 You've got common cause failure guidance
11 in this DRG. To some degree in Reg Guides but not
12 particularly in an integrated way. So you look at all
13 that and you say, well, where do I go?

14 If you're an applicant, if you're staff,
15 if you're an ACRS member, where do you go for the
16 principles and what the overall criteria are? I think
17 that's probably worth some thought in terms of you've
18 got a DRG coming out one way, a BTP coming out of a
19 similar but slightly different way, and you're Reg
20 Guides. Where is the integration of all of it?

21 That's kind of where I'm heading. If
22 you've got a similar thought process in terms of when
23 you go after you've gone through this incredibly short
24 time period. I recognize your constraints if I do
25 something in a year given you credited the DRG.

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1 You're got all this stuff coming on advanced reactors.

2 I understand why you don't want to go
3 today. It makes sense to me. Do that iteration with
4 a couple of suppliers. You go figure out what it is
5 you really want to do.

6 But then when you get through all that, it
7 seems like a good time to step back and say, we need
8 something different than any of these products. Or is
9 the BTP 7-19 the right construct to try to become the
10 sealant -- the fact that you ask -- now that I'm
11 thinking on it, maybe in the end, we've gone through
12 some more details, we can go through if there's any
13 more thoughts on that.

14 CHAIR BROWN: Thank you. Go ahead. I was
15 going to amplify his comments.

16 MR. PAIGE: I was just going to say okay.
17 That sounds reasonable.

18 CHAIR BROWN: Just another observation.
19 Once, we, the committee identified -- the committee
20 can't do the review that the staff does. There's just
21 no way. We got a day or two, three days at the most
22 to look at any new thing that's coming down the path.

23 We're not just paid. We're not here to
24 check your work. We're here to do an independent look
25 at what's being proposed and does that meet the

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1 eyeball test relative to its safety posture.

2 And the change from May 2008 till now
3 where I think there's been four, five changes that
4 we've reviewed, four new projects. And I think Diablo
5 Canyon was another one that we looked at. But the
6 idea in the I&C world of developing that architecture
7 that meets the fundamental principles which are
8 elucidated in at least IEEE Standard 603-1991, I
9 believe, although we didn't have electronic
10 communications in the days when that was written to
11 the state we had today.

12 So electronic communications as opposed
13 from control of access type issues was not the same.
14 And the first two design reviews after that first one
15 went increasingly better. AP1000 was better but still
16 missed a bunch of stuff that we had to argue about and
17 finally get done. But the last two or three, we did
18 between the staff and us.

19 They were done in less than a year because
20 just starting with an architecture and focusing on a
21 safety architecture kind of defines the general
22 ballpark in which you're operating. And as opposed to
23 trying to look at each position and in every Reg Guide
24 and every position and every IEEE standard and seeing
25 if I evaluate the brake pad right or the gas line to

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1 the distributed or to the carburetor or how many
2 electronic things do with timing. And if you look at
3 all that, you can figure out whether it's really a car
4 or not.

5 But you still don't know what the
6 framework of the car is. You don't know how many
7 doors there are. You don't know what its weight it.
8 You don't know what the engine horsepower is, et
9 cetera, et cetera.

10 You've got to look at these systems from
11 the top down. And the top down approach which is now
12 summarized in the DRG is -- and I think it initially
13 started with a -- what was it, ESBWR. It was M-
14 something. Don't you guys remember that?

15 PARTICIPANT: Mpower.

16 CHAIR BROWN: Mpower. That's right. It
17 was Mpower thing. Was that General Dynamic? No, BMW.
18 I'm sorry, BMW, right. The empire is where we first
19 got them, then it's been improved, expanded.

20 And that really has set the stage. So the
21 DRG in that particular viewpoint is the lynchpin for
22 making sure staff gets the relevant information and
23 doesn't spin their wheels on trying to examine how
24 many legs are on an ant and see if it's really an ant
25 and not a caterpillar. So these are my parting shots.

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1 I won't get an opportunity except at the
2 full committee meeting. I'll probably take this
3 transcript and repeat it just for spectators. But I
4 think there's been a considerable advance over the
5 last 16 years and the ability of the staff to address
6 these things using that architecture approach.

7 So much simpler because a lot of the other
8 stuff falls into place once you do that. Do you
9 really care how many chips are on a microprocessor?
10 You really don't. You don't really care how many
11 memory units are in an FPGA. You really don't.

12 As long as they can get data in and out,
13 that's all you care about. So anyway, all right. I
14 think I'm done. Tom, anything else? Greg, any other
15 opening remarks?

16 Are there any members opening remarks,
17 Dennis or Steve or Jose? Anybody? Okay. If I don't
18 hear anything else, we're going to proceed. Samir,
19 your turn.

20 MR. DARBALI: Thank you and good
21 afternoon. My name is Samir Darbali. We are on slide
22 3. So first, we will provide some background
23 information by going over a timeline of recent
24 activities related to the development of Revision 9 of
25 BTP 7-19, the Commission direction for the SRM, and

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1 the status of proposed response.

2 We will then provide a summary of the
3 changes from Revision 8 to Revision 9. And we'll go
4 over the changes made to the BTP is the last we
5 provided the committee back in September. And we'll
6 finish with some key messages and next steps for
7 revising BTP. Next slide.

8 So here on slide 4 is a timeline of the
9 main activities related to the development of Revision
10 9 of BTP 7-19. We start with Revision 8 which was
11 issued in January of 2021. Later that year, the staff
12 began to process and develop a SECY to recommend the
13 mission expand the Digital I&C CCF policy to allow the
14 use of risk informed approaches to demonstrate the
15 appropriate level of defense in depth for high safety
16 significant systems.

17 And in August of 2022, SECY 22-0076 was
18 issued. The staff provided a supplement to the SECY
19 in January 2023 to clarify the importance of 0.4 of
20 the policy. In May of 2023, the Commission approved
21 the staff's recommendation with some edits and
22 provided direction to the staff to develop
23 implementing guidance within one year.

24 Staff began drafting Revision 9 of BTP 7-
25 19 in the summer of 2023 and briefed the committee in

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1 September of last year. A public comment period
2 started in October and closed in November. And since
3 then, the staff has been addressing the public
4 comments and going through concurrence reviews.

5 That leads us to today's briefing. And we
6 have the full committee scheduled for March 6th. And
7 finally, we are expecting to issue the final BTP in
8 May of this year. Next slide. So here in slide 5 and
9 6, it's going to be --

10 CHAIR BROWN: You're going to force me to
11 have a letter ready in March, right?

12 MR. DARBALI: Probably, yes.

13 CHAIR BROWN: If we have comments, are you
14 going to be able to commit to resolving them? Because
15 if we do ask, we may ask for a response to the letter
16 depending on the nature of the comments. So if you
17 want to issue it in May, we would have to see
18 something that allows us to say okay so we don't have
19 to have another meeting in April.

20 MEMBER HALNON: Okay. Why don't we
21 address that if we have comments. So then we can --

22 CHAIR BROWN: I won't have a comment. So
23 I'll right the letter. I'm just saying we've got to
24 keep that in mind.

25 MR. DARBALI: Yeah, that's something we

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1 can discuss to ensure that.

2 CHAIR BROWN: Okay.

3 MR. DARBALI: And we appreciate the
4 feedback. So here on slide 5 and also on slide 6,
5 basically a repetition of what I just said on that
6 timeline diagram. We received approval or the
7 Commission approved the SECY with some edits and
8 directed staff to clarify in the implemented guidance
9 that the new policy is independent of the licensing
10 pathway and also directed the staff to final implement
11 the credits for the year. Next slide, please.

12 And the staff's proposed response, we're
13 here to discuss is the light water reactors. We are
14 revising the guidance in BTP 7-19 for the review of
15 risk informed approaches which may result in the use
16 of design techniques other than diversity. Because of
17 the one-year metric, we should implement guidance.

18 The staff has spoken, the edit is mostly
19 to incorporate the standard policy and providing some
20 clarification. We have also made changes to address
21 feedback we received during the full committee --
22 sorry, during the September subcommittee briefing and
23 also in response to all the comments.

24 CHAIR BROWN: Before you go on, I've seen
25 the -- I didn't ask this question previously. But

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1 you've had the words design techniques other than
2 diversity. Do you have any idea of what you mean by
3 that? I try to think of design techniques other than
4 the one we rely on to try to get a feel for it and
5 could not figure out.

6 MR. DARBALI: So as you'll probably see in
7 one of the follow-up slides.

8 CHAIR BROWN: You could go back to vacuum
9 tubes.

10 MR. DARBALI: So for example, segmentation
11 could be a technique that could be used to eliminate
12 the potential for a common cause failure. There may
13 be some -- we call them design techniques for the
14 development or some changes in the architecture in
15 implementation. But we would be reviewing those as
16 they come in, in the application.

17 DR. BLEY: Charlie, it's Dennis. I'm
18 trying to help out the staff here a little bit. In
19 your section, B-313, they get a little smarter. Then
20 it's talking about design options. They talk about
21 technical approaches including design techniques where
22 you just talk about prevention measures and radiation
23 measures. So that seems to be what their thought is.

24 CHAIR BROWN: Now the difficulty with
25 segmentation is it's not really well defined. And

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1 when I see stuff like that where we don't have at
2 least boundary conditions or something with which
3 applicants can deal with, I don't like to see
4 surprises coming in and then having a long time delay
5 trying to get something done because there's so many
6 new design techniques they'd like to try that you now
7 have to go through a stork dance to try to say it's
8 okay. So instead of a year to complete the review,
9 you're into a three-year cycle as you ask 500 RAIs of
10 the answers you want which is actually what we saw in
11 the first couple of design requests when I first got
12 here 16 years ago or at least the second one had a ton
13 of them.

14 I mean, it was a lot. We could barely
15 keep up with the revisions they incorporated RAIs. So
16 there's a -- that's a thorny path to go down. So
17 anyway, all right, I'll stop.

18 MR. DARBALI: Understood. Thank you. All
19 right. So we are on slide 7. And here are the
20 substantive changes made from Revision 8 through
21 Revision 9. And we've explained these back in
22 September.

23 So Section B.1.1 was revised to update
24 the language of the four points in the policy.
25 Section B.1.2 was revised to clarify the term,

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1 critical safety function. Section B.3.1.3 which
2 Member Bley just mentioned was revised for the
3 evaluation of alternative approaches.

4 Section B.3.4 was added for the evaluation
5 of risk informed assessments. Section B.4 was revised
6 to include guidance for the evaluation of different
7 approaches for meeting point 4. We added five flow
8 charts to facilitate the use of the BTP. And we also
9 added language from Reg Guide 1152 regarding
10 communication independence and control of access.
11 Next slide. Thank you. Here on slide --

12 MEMBER ROBERTS: Just a quick question.
13 I'm a little surprised you didn't include the
14 background information that you added in Section A or
15 8.1, whatever that was at the very beginning. I
16 thought it was really good in terms of getting more
17 background going back to the '60s of what drove this
18 whole issue of concern about common cause failures and
19 defense in depth.

20 And what caught my eye is there was a
21 reference to the front matter of Appendix A or 10 CFR
22 50 where you talked about there is a -- I'm going to
23 call it a hidden requirement. It's kind of subtly
24 buried in the front matter of Appendix A or 10 CFR 50
25 to go assess common cause failures for basically any

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1 design. And I was wondering if that was the intent
2 was to highlight that, that was wasn't necessarily
3 widely understood. And then also there's a comment,
4 a quasi-editorial comment. I was wondering why that
5 didn't get in the list of regulatory basis documents
6 that was in the next section.

7 MR. DARBALI: I see Norbert wants to chime
8 in. So we --

9 (Simultaneous speaking.)

10 CHAIR BROWN: -- talk about the expanded
11 background from Rev. 9. Yeah, I noticed. I just
12 liked it. That was a good idea.

13 MR. DARBALI: So what we're highlighting
14 in this slide and the next probably five, six slides
15 is basically what we presented back in September. In
16 the markup that you have, that shows the changes from
17 the September version. And that includes all the
18 additional background and historical information. So
19 later on --

20 CHAIR BROWN: I got that.

21 MR. DARBALI: Okay. So later on, we'll be
22 covering that number.

23 MR. CARTE: All right. So in part, that
24 -- sorry, Norbert Carte, I&C technical reviewer. So
25 in part, that was expanded because in the discussions,

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1 industry has made assertions in public meetings that
2 this is a new criteria or a new issue. And in order
3 to put an end to those assertions, we've inserted that
4 material.

5 And there are other places you could look
6 to see the history of common cause failures. So
7 common cause failure has been a concern as well in the
8 '50s with the research and test reactors. There's a
9 NUREG/CR-566 that talks about it. It was written in
10 1979.

11 So there are a number of NUREG/CRs that
12 have talked about common cause failure. The only
13 thing that's new and different is that we're talking
14 about a different technology and a different maybe
15 system architect for I&C systems. So the question is,
16 what do you need to do differently for the different
17 technology or methodologies or system design?

18 It's not that we're inventing a new
19 criteria of common cause failure because that's always
20 been there. It's just that what you build -- if you
21 build a stone bridge and then it falls down and you
22 build a wooden one and a regulator asks you, well,
23 what about termites? You said, well, I never had to
24 consider termites when I built the stone bridge. What
25 are you asking about termites now for?

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1 You're backfitting a requirement. When we
2 talk about it, it seems silly. But that's what's
3 happening with Digital I&C. You're saying, we did
4 this for analog systems, and so those should be the
5 only requirements regardless of the technology of the
6 system design we give you.

7 No, not really. You need to consider the
8 hazards introduced by the technology. And so this is
9 sort of emphasizing that. And I think that was added
10 to Appendix A in 1979.

11 MEMBER ROBERTS: Yeah, so the second
12 paragraph of the introduction. So it's there. It
13 just seemed to me like a regulatory requirement the
14 way it's quoted from Appendix A. And you didn't
15 include it in the regulatory basis section there. So
16 I was trying to understand why.

17 MR. CARTE: Right. So regulatory
18 requirements are an interesting term. So you never
19 right a violation against Appendix A. What the
20 regulatory requirement is that you include principle
21 design criteria in your FSAR and that your application
22 is in conformance with your FSAR.

23 So you get an Appendix B violation, a
24 quality control violation for not meeting your design.
25 So in a sense, Appendix A isn't really a regulatory

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1 requirement. It only becomes a requirement or an
2 obligation when you put it in your FSAR and you say
3 that's what you're going to do.

4 And so Appendix A, it's a minimum for
5 light water reactors. But also notes it may not be
6 complete. You may need to add other things, and maybe
7 you should design criteria for digital system. But
8 that's a different discussion.

9 MEMBER ROBERTS: Okay. I understand.
10 From a staff review perspective, having it in the
11 front matter is probably enough. But the way it's
12 written, it seems like if the applicant hasn't
13 addressed common cause failure at that general level,
14 then they would be -- it certainly would be questioned
15 about whether or not the meaning and intent of
16 Appendix A. I suspect that's why you put it there, so
17 I think you've answered my question. Thank you.

18 MR. DARBALI: Thank you. So on slide 8,
19 we have -- it's an overview of Provision 9 of the BTP.
20 This figure shows how the BTP sections are organized
21 to implement the policy. And that's SECY 22-0076.

22 You can see for each point in the policy
23 the applicable section of the BTP. And this is a
24 figure we added to the end of the BTP after the
25 September briefing. So in the next few slides, we'll

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1 go over the substantive changes again from Revision 8
2 to Revision 9. Next slide.

3 So on Section B.1.1, we updated the
4 language to reflect the points in FSAR and SECY 22-
5 00076 as well as the explanation of the four points.
6 We also added some language to help identify the
7 applicable BTP sections when performing a safety
8 evaluation. On Section B.1.2, we clarified that
9 critical safety functions are those most important
10 safety functions to be accomplished or maintained or
11 prevent any immediate threat to the health and safety
12 of the public.

13 We also clarified that the critical safety
14 functions within the SECY are examples represented of
15 operating light water reactors. And that other types
16 of reactors may have different critical safety
17 functions based on the reactor design safety analysis.
18 And the identification of such functions may be risk
19 informed.

20 MEMBER HALNON: Samir, this is Greg
21 Halnon. I need to go back and look and I should've.
22 The term critical safety function, is that aligned
23 across the definitions that we have for critical
24 safety functions in addition to what we were talking
25 about in Part 53? Is it relatively aligned? I'll

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1 give you an out there.

2 MR. DARBALI: So right, we added a
3 footnote to clarify where the term came from. And it
4 goes back to an ANSI/ANS standard.

5 MEMBER HALNON: So it is based somewhere
6 that we can pin that off of for other things.

7 MR. DARBALI: So historically, it's been
8 used for light water reactors. It came after KMI
9 event. But it's applicants or licensees can define
10 their critical safety function based on their
11 particular safety analysis and planned design.

12 So we have a list of critical safety
13 functions. But again, that applies to light water
14 reactor designs. Not only light water reactors or
15 other types of reactor designs can identify their role
16 in particular critical safety functions.

17 MEMBER HALNON: Okay. That's fine. I
18 just want to make sure that we weren't going off on
19 very specific -- it was going to cost me confusion in
20 the future. But I'll say it's relatively aligned with
21 what we've been using all along. It's nothing new.

22 MR. DARBALI: Correct, correct. It's not
23 -- we're not introducing it in here. Thank you.

24 CHAIR BROWN: Excuse me. You really
25 didn't eliminate anything. You used to have it in a

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1 little table. And all you do is put them in a line in
2 parenthesis --

3 MR. DARBALI: Correct.

4 CHAIR BROWN: -- which seemed kind of
5 unusual. The other thing I noticed in the critical
6 safety functions, you deleted references to SECY 93-
7 087. And for the life of me, does that mean it
8 doesn't exist anymore?

9 MR. DARBALI: So that's part of a broader
10 comment. And we'll address that later. But one of
11 the comments --

12 CHAIR BROWN: Let me tell you. Remember
13 we wrote a letter on a SECY.

14 MR. DARBALI: Right.

15 CHAIR BROWN: And we noted in that letter
16 your revised 0.4 had three or four paragraphs. You
17 all only pulled paragraph 1 out and put it in 0076
18 which eliminated the items. So our point was is that
19 still valid, that SECY? The answer came back yes.
20 And then I read this and started seeing references to
21 087 deleted which sounded like you were eviscerating
22 0087. So disregarding it or it was no longer in the
23 process of being applied.

24 MR. DARBALI: We followed the same, I
25 guess, logic that you were using that if we referenced

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1 22-0076, we are therefore referencing 93-087 or those
2 parts.

3 CHAIR BROWN: Is that still in place?

4 MR. DARBALI: Yes.

5 CHAIR BROWN: Okay.

6 MR. DARBALI: So when we mentioned 22-
7 0076, that includes 22-0076 and whatever 22-0076 did
8 not change from 93-087.

9 CHAIR BROWN: Now the exception to that is
10 paragraph 4 stated that for manual controls, you can
11 have either hardwired or a diverse system or a diverse
12 approach technique. I've forgotten what the exact
13 words are. But yet when you go to 0076, you all now
14 have cranked in to the text of BTP these words about
15 don't bother with hardware wired controls. You don't
16 need to do that.

17 But diverse systems, and I'm going to talk
18 about this later. I'm just kind of giving you a heads
19 up. There's going to be some excoriating comments.

20 MR. DARBALI: Okay. So --

21 CHAIR BROWN: One comment, one comment.

22 MR. DARBALI: But the driver who eliminate
23 -- mentions SRM SECY 93-087 was because we received a
24 public comment that said we would talk about a point
25 -- we said .3 of the policy. And the comment was,

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1 well, it's not clear. Are you talking about 22-0076

2 --

3 CHAIR BROWN: I got that.

4 MR. DARBALI: -- 93-087? So we figured,
5 well, if we're mentioning 22-0076, we're also covering
6 those parts of the 93-087 that were not changed. So
7 let's just point to 22-0076 so it'd be less than
8 (audio interference).

9 CHAIR BROWN: How does the point get made
10 in this that 087 still applies but with where it has
11 been changed or modified by 0076. That's what then is
12 relevant for that part?

13 MR. DARBALI: So I --

14 CHAIR BROWN: And you all didn't -- so
15 there's no explanation of the rest of 087 that wasn't
16 changed is okay?

17 MR. DARBALI: Right. You would have to go
18 from the BTP 22-0076 which would make --

19 (Simultaneous speaking.)

20 CHAIR BROWN: That's a long chain to try
21 to figure out what's going on.

22 MR. DARBALI: Right.

23 CHAIR BROWN: And the applicant shouldn't
24 have to do that. They should be using this document,
25 not the -- I didn't have any problem with all the

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1 other incorporation of the points. It was just the
2 absence of information.

3 I understand why you want to do it because
4 which one are they going to follow. So you tell them
5 what parts are still valid and which parts aren't.
6 And you didn't do that.

7 MR. DARBALI: Okay, understood.

8 CHAIR BROWN: That may be a comment.

9 MR. DARBALI: And you can go to the next
10 slide, slide 10. Okay. And --

11 CHAIR BROWN: So the other point I would
12 make is the Commission also did not say anything at
13 all about the other three paragraphs. They only
14 address the one you provided in your SECY --

15 (Simultaneous speaking.)

16 MR. DARBALI: Correct, yes.

17 CHAIR BROWN: -- which you didn't
18 aggregate anything in 087. It's kind of an
19 amplification of diversity.

20 MR. DARBALI: So here on slide 10, we have
21 the alternatives to diversity. And again, it goes
22 back to the section Member Bley mentioned. The
23 Section B.3.1.3 is for alternative approaches other
24 than diversity and testing to eliminate potential or
25 common cause failure from further consideration.

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1 Provision 8 of the BTP provide a review
2 guidance for an application that uses an NRC approved
3 method or approach but did not provide for their
4 review and application that uses a new approach. So
5 we revised this section in Revision 9 to remove detail
6 acceptance criteria for methods or approaches
7 previously approved or endorsed because the means of
8 endorsement or approval already capture the
9 application's specific review activities. So the
10 staff only has to ensure that the approach is
11 acceptable and is being followed and if there's any
12 deviations that are justified. In Revision 9, we
13 added acceptance criteria for the use of new
14 approaches not previously endorsed and approved,
15 mainly that the application --

16 CHAIR BROWN: Can you back up a minute?

17 MR. DARBALI: Yes.

18 CHAIR BROWN: The first bullet, previous
19 endorsement or approval.

20 MR. DARBALI: Right.

21 CHAIR BROWN: Pathways for evaluation of
22 alternative -- that first bullet says, if something
23 has already been endorsed or approved, it's still
24 endorsed or approved if something else wants to use
25 it?

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1 MR. DARBALI: That would be one path.

2 CHAIR BROWN: That's okay. So that's the
3 first path?

4 MR. DARBALI: Yes.

5 CHAIR BROWN: The second is the stuff
6 spelled out. And then you have the acceptance
7 criteria provided?

8 MR. DARBALI: Correct.

9 CHAIR BROWN: Okay. I got it.

10 MR. DARBALI: So mainly for a new approach
11 that hasn't been previously approved or endorsed, the
12 staff would review that the application contains a
13 description of the new alternative approach, a
14 description of the CCF vulnerability being addressed,
15 and a justification for the use of such approach.

16 MEMBER HALNON: Samir, I always get a
17 little bit worried about these iterative approaches
18 where I come in with an alternative rock and we don't
19 like that rock. And it's inefficient, at least at the
20 front end. How are you going to capture lessons
21 learned? And I wouldn't say -- endorse is not the
22 right word. But at least have the license of the
23 applicant see what's been accepted from a methodology
24 perspective.

25 MR. DARBALI: So typically, a new approach

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1 would be proposed in the form a topical report that
2 would allow for generic approval that can be
3 referenced. We've had cases in which a new approach
4 is used.

5 MEMBER HALNON: As long as it's not
6 proprietary, people will see that.

7 MR. DARBALI: Correct, right. And topical
8 reports, it could be a redacted version, a public
9 version. If a new approach is using a licensing
10 review and likewise a different applicant can propose
11 to use that as a precedent if they can adequately
12 demonstrate that it applies to their design. There
13 are different ways. I agree and understand that if
14 it's something completely new to the staff and it
15 might be a more arduous process to identify the
16 information that is needed and be able to perform
17 that.

18 MEMBER HALNON: So more and more, we're
19 seeing especially for the advanced reactors lines on
20 this pre-application engagement. And another way of
21 saying that is regulatory uncertainty. So I hope that
22 there's internal conversations going on in how we can
23 get back to our mission of regulatory certainty in
24 these types of approaches because that's going to cost
25 a lot of money, staff time and applicant time, not

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1 necessarily get to where we want to be quickly.

2 MR. DARBALI: Right. And so ISG-06 for
3 the licensee review of the upgrades, so mostly for
4 operating plans, there's also focus on those pre-
5 application engagement meetings. So we've had those
6 for past reviews and current reviewed where an
7 applicant would propose what their design or features
8 they want to incorporate. So right, it does
9 facilitate some of that reduction or regulatory
10 uncertainty. And of course, right, it's going to be
11 -- for the very first few new innovative designs or
12 techniques or alternatives, it's going to be maybe a
13 bit of an uphill process. But the idea, right, is to
14 capture lessons learned and formalize that.

15 MEMBER HALNON: Okay. Yeah, I think
16 that's important to quickly get those lessons learned
17 back out so that folks that are trying to contemplate
18 how I'm going to approach this, they would see what's
19 been accepted or at least an approach that might be
20 more certain. Thank you.

21 CHAIR BROWN: You had to deal with this
22 because you're relative to the plant. I thought ISG-
23 06 was a good idea because people were struggling with
24 how to approach submitting their final LAR licensing
25 amendment request or whatever (audio interference).

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1 Do you agree or disagree with that approach?

2 I thought that eliminated uncertainty when
3 they finally got into it. They knew what to expect --
4 the staff was going to expect when they submitted
5 their request. And so I don't want to lose ISG-06.

6 MEMBER HALNON: I'm not suggesting that.
7 (Simultaneous speaking.)

8 MEMBER HALNON: I'm not suggesting there's
9 an flaws in that. What I'm saying is that with the
10 continued reliance of if you got a new approach, come
11 on in and talk to us about it.

12 CHAIR BROWN: Before you --

13 MEMBER HALNON: The better you can define
14 the acceptance criteria and how you get from A to B
15 will add more certainty. But at the first, relatively
16 uncertain, how are you going to be received?

17 CHAIR BROWN: That's why we wrote ISG-06.
18 Let's try to define that, what to expect for that. I
19 don't know where that exists in any other area.

20 MEMBER HALNON: Okay. So in the uncertain
21 approaches, 3.1.3, last statement says, ensuring the
22 adequate justification provided for any deviation from
23 the progressive. Then it says therefore, this BTP
24 does not provide additional guidance in this regard.

25 CHAIR BROWN: Was that on the first line?

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1 Where are you? It's 3.1.3? You print it out
2 differently. Okay.

3 MEMBER HALNON: So after that without
4 additional guidance, you have to go somewhere else.
5 So now you're --

6 (Simultaneous speaking.)

7 CHAIR BROWN: Right, right.

8 MEMBER HALNON: Again, you start getting
9 in this daisy chain of what's going to be accepted and
10 what's not. And it gets more complicated.

11 CHAIR BROWN: Thank you.

12 MR. DARBALI: Thank you. All right.
13 Slide 11, please. So I'll now turn it over to Steven
14 Alferink who will discuss the risk informed D.3
15 assessment process.

16 MR. ALFERINK: Thank you, Samir. As Samir
17 said, my name is Steven Alferink and I'll discuss the
18 review guidance for risk informed D.3 assessment, the
19 new Section D.3.4. This slide illustrates how the
20 staff envisions their risk informed approach getting
21 into the overall D.3 assessment process.

22 The D.3 assessment process starts by
23 defining each postulated CCF. Once the CCF is
24 identified, it can be addressed deterministically or
25 by justifying alternative approaches. These options

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1 are shown in the two boxes in the middle.

2 If a CCF is not addressed using either of
3 these two option, then it can be addressed using a
4 risk informed approach which is shown in the colored
5 box on the right. The review of a risk informed D.3
6 assessment was broken down with four steps, each of
7 which is covered in corresponding subsections of
8 Section D.3.4. I'll cover each of these steps at a
9 high level in the following slides. Next slide.

10 So we are now on slide 12. This slide
11 covers the first two steps of the review of a risk
12 informed D.3 assessment. The first step is to
13 determine consistency with NRC policy and guidance on
14 a risk informed decision maker.

15 In this step, the reviewer will review an
16 application that uses a risk informed approach for
17 consistency with established NRC policy and guidance
18 on risk informed decision making as required by 0.2 of
19 the policy. Light water reactors that will be
20 reviewed using BTP 7-19 established NRC policy and
21 guidance on risk informed decision making includes Reg
22 Guide 1.174 and Reg Guide 1.200. The second step is
23 to review how the CCF is modeled in the PRA.

24 In this step, the reviewer will first
25 determine if the base PRA meets the PRA acceptability

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1 guidance in Reg Guide 1.200 for approval and guidance
2 for new reactors and reflects the plan or design at
3 the time of application. The reviewer will then
4 evaluate how the CCF is modeled in the PRA and the
5 justification that modeling adequately captures the
6 impact of the CCF. In general, a CCF can be modeled
7 in a PRA through detailed modeling of the Digital I&C
8 system or the use of surg events. Surrogate events
9 can be existing basic events in the PRA or new basic
10 events added to the PRA that capture the impact of the
11 CCF on the plant.

12 CHAIR BROWN: Before you shift, Bob, did
13 you have a comment?

14 MEMBER MARTIN: Yeah, this is Member
15 Martin. I noticed we're kind of reading through this
16 new section. The terminology, risk significance, it's
17 new. Previously, the safety (audio interference).

18 CHAIR BROWN: Dave, you're breaking up.
19 Excuse me. Bob, you're breaking up.

20 MEMBER MARTIN: Am I breaking up?
21 Hopefully, this is better.

22 CHAIR BROWN: You were.

23 MEMBER MARTIN: My question is the
24 terminology of safety significance and risk
25 significance, is the use of risk significance here

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1 strictly in the context of this risk informed D.3
2 assessments and terminology for safety significance be
3 more applicable for the best estimate approach?
4 Anyway, those terms should very similar. And the
5 potential for confusion, misuse, I think might be
6 there. I want to hear from you guys on how do you
7 view those two terms and how they're applicable and
8 different pathways in the D.3 assessment?

9 MR. ALFERINK: This is Steven Alferink.
10 So we did include a discussion on the distinction
11 between risk significance and safety significance in
12 the revised BTP. But to answer your question earlier,
13 yes, you would only worry about risk significance if
14 you're -- or if the license or applicant was following
15 risk informed approach.

16 MEMBER MARTIN: Okay, okay.

17 CHAIR BROWN: Is there another hand
18 raised? Dennis? Dennis?

19 DR. BLEY: Yeah, Charlie. I was -- I had
20 already flagged for later a little discussion about
21 this. Let me find my notes because this associated
22 with their slide 22. That's where they get over the
23 Section 3.4.

24 I was a little unhappy with the
25 introductory material in 3.1.4 where there's strong

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1 statements about risk significance and safety
2 significance are very different concepts. They don't
3 have the same meaning. And it's all used to set up
4 the distinction between risk and safety significance
5 is to emphasize you need to consider safety margins.

6 I would say that any PRA that's done right
7 has to consider the safety margins. The staff in this
8 section refers us to NUREG 2122 which is a glossary.
9 And the glossary makes clear what the glossary is
10 talking about.

11 And the glossary is talking about the
12 definitional difference where risk significance is
13 looking at the impact on risk and really safety where
14 safety significance is the label we use for safety
15 related things that through other methods primarily,
16 expert judgment in the past set up safety significance
17 that if one goes to the end of that definition, that
18 the staff cites -- they point out -- the NUREG points
19 out that when used to qualify an object such a system
20 structure compound accident sequence. The term
21 identifies the object as having an impact on safety,
22 whether determined through risk analysis or other
23 means which exceeds a pre-determined criterion. For
24 me, that's in other words when risk significance is
25 known, it should be used to identify the safety

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1 significant items.

2 So there seems to be a real emphasis in
3 that section that these things are totally different.
4 But they're only totally different when you're
5 thinking of safety significance as things that have
6 been designated as safety related. I think the
7 document would be better without that discussion. It
8 isn't very clarifying. And in my opinion, it's a
9 little bit wrong. That's all. That's my speech,
10 Charlie.

11 CHAIR BROWN: Okay. Thank you.

12 MR. ALFERINK: Thank you. Next slide.
13 We're on slide 13 now. The third step is to determine
14 the risk significance of the CCF. The risk
15 significance of a CCF can be obtained by calculating
16 an increase in the risk from the CCF using either a
17 bounding sensitivity analysis that assumes that CCF
18 occurs or a sensitivity analysis that uses the
19 conservative value less than one for the probability
20 of the CCF which we loosely call a conservative
21 sensitivity analysis in this slide.

22 The increase in the risk is calculated
23 using a conservative sensitivity analysis. The
24 reviewer will evaluate a technical basis with a
25 conservative probability of the CCF. The impact of

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1 this assumption on PRA uncertainty and whether it is
2 considered a key assumption and the impact of this
3 assumption on the key principles of risk informed
4 decision making.

5 The reviewer will determine the risk
6 significance of the CCF by comparing the increase in
7 the risk obtained from the sensitivity analysis
8 thresholds for CDF and LERF. The reviewer will
9 determine that CCF is not risk significant if the
10 increase in CDF is less than one times 10 to the -6
11 per year and the increase in LERF is less than one
12 times 10 to the -7 per year. It is important to note
13 that there's a fundamental difference between the
14 intent of risk evaluations performed or risk informed
15 applications involving BTP 7-19 and those that do not
16 involved BTP 7-19.

17 Evaluations performed for risk informed
18 applications that do not involve BTP 7-19 are intended
19 to calculate the change in risk due to a proposed
20 licensing action and therefore reflect the as-built
21 and as-operated or as to be operated by. As such,
22 proposed licensing actions that result in an increase
23 in risk above 1 times 10 to the -5 per year are
24 normally not considered as discussed in Reg Guide
25 1.174.

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1 MEMBER ROBERTS: Before we leave this
2 slide, can you explain that second sub bullet under
3 the third bullet, demonstrate that all principles of
4 RIDM are addressed why that's a sub bullet. Because
5 it seems like you already said that in the previous
6 slide as one of the entry conditions into doing a risk
7 informed approach to this.

8 MR. ALFERINK: Our perspective, you're
9 correct. We did discuss the risk informed decision
10 making. We were talking about meeting the overall
11 policy and guidance.

12 Normally, when you have a sensitive
13 analysis that assumes it occurs, there are a lot of
14 things you don't need to worry about, for example, a
15 certain value probability. We were trying to
16 emphasize here that if you are using that assumption,
17 going to emphasize that you need to consider that and
18 address that. I view it more as a point of emphasis
19 if you're following that direction.

20 MEMBER ROBERTS: Okay. I guess this needs
21 some run time. I understand from one of the NEI
22 comments that nobody currently plans to assume a
23 conservative, probably less than one. But there may
24 be a future time where that could be done.

25 Probably that's a good time to revisit

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1 this because it just seems to me like it's a
2 duplicative requirement. It may not be clear exactly
3 why you basically restated the same thing under a
4 subheading that you have to have already accomplished
5 just to get this far. Okay, thanks.

6 MR. ALFERINK: Thank you. Now the
7 evaluations performed for risk informed applications
8 involving BTP 7-19 are only intended to determine the
9 risk significance of the postulated CCF. These
10 evaluations are not intended to calculate the change
11 in the risk due to the introduction of the Digital I&C
12 system nor the baseline risk of the Digital I&C system
13 installed. These evaluations do not reflect the as-
14 built and as-operated or as to be operated. Next
15 slide.

16 MEMBER ROBERTS: You mentioned this slide
17 helped setup my question. But I was confused by what
18 B.3.4.4. was trying to say. If you start from the
19 SRM, the SRM language says if you're -- basically
20 you're reading it inverted.

21 If your common cause failure is risk
22 significant, then you need to do something else,
23 basically what it says. You can use diversity or
24 other techniques, whatever those are. But your
25 choices are not to go do more risk analysis the way I

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1 read the SRM.

2 I couldn't get that out of what you wrote
3 at 3.4.4. And it seemed like what 3.4.4 either should
4 say or maybe was intended to say is go back to 3.1
5 through 3.3 and pick something else with the
6 justification. This justification may be shaded by
7 the risk significance.

8 Is that what you were intending to say,
9 that you can't do a risk analysis? You get out of it
10 once you've already had risk significance. What you
11 do is something in the designs, something in hardware,
12 something in analysis space, not risk space. Is that
13 right, or did I not understand whether the SRM said or
14 what this paragraph is intending to say?

15 MR. ALFERINK: I think you had that
16 correctly. You're always welcome or an applicant is
17 always welcome to go back. They like to redesign.
18 But if you're assuming this step occurs, you have to
19 have a bigger change to your system in order to
20 accommodate that.

21 MEMBER ROBERTS: All right. So maybe the
22 suggestion is go back and relook at 3.4.4. I think
23 you don't say that in the section. I think that's
24 pretty important to say that once you concluded that
25 your problem -- your -- I'm sorry, your common cause

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1 failure is significant, then you have to go do
2 something. And maybe the justification of how much
3 you have to explain why that's good enough would fit
4 into the chart you got up on the wall here that if you
5 were in Region II, you need maybe less justification
6 of why that's okay if you're in Region I.

7 MR. ALFERINK: So as you see in the graph,
8 if you're in Region III, we would rely on the standard
9 design and verification, validation processes. If
10 you're in Regions I or II, then yes, you need to
11 provide something more than that. In the later
12 review, that would be commensurate with the rest
13 significance of it.

14 MEMBER ROBERTS: Begin the point if you
15 need to something. If you're in Region III, you can
16 say, my design is good enough because the common cause
17 failure is not risk significant. If you're Region I
18 or II, you can't do that. That option is not there.
19 You have to do something.

20 And the something is pretty well defined
21 in 3.1 through 3.3. Lots of options. But I think the
22 point is you need to do one of them and then justify
23 why that's good enough given the risk information is
24 part of the justification. I think it's what you
25 intended. I'd suggest you go back and look at that

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1 section to see if you think it actually says that
2 because I couldn't get what he said.

3 DR. BLEY: This is Dennis too. I agree
4 with Tom on this one. But I would point out if you
5 really got to the point where you could do any viable
6 risk analysis of a software based Digital I&C system,
7 then when you came up with change back in Section
8 3.1.3, you could certainly update your risk assessment
9 and show that way that it improved the risk.

10 MEMBER ROBERTS: Yeah, Dennis. I agree
11 with that. Depending on the technology of the risk
12 assessment and why you can model the I&C system, the
13 ideal closed form solution is you go redesign your
14 system, repeat the risk analysis, show that you're no
15 longer in Region I or II and say I've done my risk
16 assessment. I've changed the design based on the risk
17 assessment. And now I've concluded basically the risk
18 assessment. I'm good to go.

19 (Simultaneous speaking.)

20 DR. BLEY: I agree with that. But that's
21 not going to happen in our lifetime. So we're --

22 (Simultaneous speaking.)

23 MEMBER ROBERTS: And so the language for
24 the SRM as I read it is you basically. You gave it a
25 shot. You did not succeed in getting their risk

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1 space. So you go back to deterministic space.

2 MR. ALFERINK: You need to do something is
3 how characterize it.

4 MEMBER ROBERTS: Right.

5 MR. ALFERINK: And that something could be
6 commensurate with the risks and the events of it.

7 MEMBER ROBERTS: Right.

8 MR. ALFERINK: So it's not going back --
9 totally back to the first. You can do something else
10 other than the first.

11 MEMBER ROBERTS: Right. As already laid
12 out in Section 3.1 through 3.3. There's lots of
13 options, including the premier rock option. You can
14 do it if you come up with a good approach.

15 DR. BLEY: Dennis again. The paragraph
16 comes pointing to us, the second paragraph in 3.4.4.
17 If you read that as is, it kind of sounds like you
18 don't need to do anything. You can make a technical
19 justification. But the language there doesn't say
20 what you guys just said. And I think you ought to
21 clean that up.

22 MR. ALFERINK: We're on slide 14 now. And
23 the fourth step is to determine appropriate means to
24 address the CCF. And this slide illustrates a graded
25 approach for the review based on the risk significance

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1 of the CCF.

2 The risk significance of the CCF is
3 characterized by mapping its increase in the risk for
4 the regions in figures 4 and 5 are in Reg 1.174. This
5 figure illustrates this mapping based on CDF. A
6 similar figure would illustrate this process based on
7 LERF.

8 If the CCF is not risk significant,
9 meaning if the increase in risk follows Region III, a
10 reviewer should include that standard design and
11 verification validation processes are sufficient to
12 address the CCF. If the CCF is risk significant,
13 meaning if the increase in the risk follows in Regions
14 I or II, the reviewer will evaluate the CCF against
15 the acceptance criteria with a level of technical
16 justification you enter with the risks of CCF. I'll
17 now hand the presentation back to Samir.

18 DR. BLEY: Before you leave that one, can
19 I ask you a question? It's Dennis. What you said all
20 makes sense because it's a change. What isn't quite
21 stated is I guess the change you're looking at is the
22 change between a Digital I&C system that works
23 perfectly and this one that you've either assumed
24 would fail or you assume the common cause would fail
25 it or you assume something kind of short of that. But

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1 you are using 1.174 as looking at a change. So it's
2 a change in this system to assume failure with the
3 previous one, right?

4 MR. ALFERINK: That's what I was trying to
5 clarify in the previous slide. So the intent of this
6 risk evaluation is different than what we would
7 normally look at, Reg 1.174. And here we're looking
8 at what would be the maximum increase if a CCF were to
9 occur if you did evaluating since finishing the
10 analysis.

11 DR. BLEY: Compared to the same system
12 without the CCF?

13 MR. ALFERINK: Compared to the baseline.
14 Now assume the I&C system is not modeled in the PRA.
15 And as you add it in there and failing it, and that's
16 what you would be comparing.

17 DR. BLEY: Okay. That's a clarification.
18 There was something in your response to one of the
19 comments that made it sound like you intended
20 something else. But that makes sense now. Okay.

21 MR. ALFERINK: Thank you. So here we are
22 on slide 15. Now we'll talk about the changes made to
23 Section B.4 regarding 0.4 of the policy. For the
24 review of an application, that implements independent
25 and diverse main control room displays and controls

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1 for manual actuation of critical safety function.

2 Section B.4 of the BTP provides this
3 acceptance criteria. SRM SECY 22-0076 includes a
4 sentence that allows applicants to propose a different
5 approach if the plan design has commensurate level of
6 safety. We've added review guidance to Section B.4
7 for the review of applications that propose a
8 different approach that does not meet all the
9 acceptance criteria in B.4. Next slide.

10 So here on slide 16, we're now looking at
11 the changes to the BTP since the previous ACRS. So
12 basically, we made clarifications throughout the BTP
13 to address some of the discussions held during that
14 September briefing. Comments from Member Brown and
15 Member Roberts that were provided as an attachment to
16 the transcript and public comments.

17 We received a total of 35 public comments.
18 And they were all provided by NEI. And we appreciate
19 and value all the comments received. And we believe
20 they helped improve quality and the clarity of the
21 BTP.

22 We also made some staffing initiated
23 clarifications. And we removed some references that
24 were either unused, unnecessary, or do not provide
25 historical value to the discussions in the BTP. A key

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1 point we want to make is that we have not made
2 substantive changes to the analysis, methodologies for
3 the acceptance criteria in the BTP. Now we're going
4 to go over these changes.

5 Note that we only have slides for the
6 sections that have changes. And initially, the
7 following slides, you will see the change listed. And
8 in parenthesis, you'll see the comment that drove that
9 change.

10 So we're on slide 17. We have the general
11 changes that apply to the whole BTP. First, we revise
12 the BTP to consistently use the term, Digital I&C
13 system, instead of using the many variations of the
14 term.

15 This also ensures that we are using
16 language consistent with the language used in the SRM.
17 Also, whenever we refer to a point in the policy, it
18 wasn't clear which SRM we were referring to. So we
19 revised the BTP to explicitly say that the point being
20 discussed is an SRM SECY 22-0076. And we also revised
21 the BTP to consistently use the term defense in depth
22 and diversity.

23 MEMBER ROBERTS: To follow up on NEI
24 Comment 24, and this may apply more for the DRG and
25 the new reactors than for BTP 7-19. But the DRG calls

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1 it diversity and support of defense in depth which is,
2 I think, a more descriptive term and is more
3 consistent with the NEI comment was trying to get at.
4 With that point is that diversity is a means of
5 achieving defense in depth.

6 And what they didn't say in the comment,
7 I guess the question I want to through out to you is
8 their point is that diversity isn't always necessary
9 to achieve defense in depth. And duals of that might
10 be that diversity isn't always sufficient to achieve
11 defense in depth. I just want to throw that out
12 there.

13 And the context would be at a new reactor.
14 And it gets into the term, defense in depth, which is
15 not really clearly defined, I found, in the DRG. It
16 used to be clearly defined in the branch technical
17 position with reference to NUREG/CR-6303. It defines
18 the four echelons of defense for light water reactor
19 which derived pretty well from a more classic defense
20 in depth model of the barriers to radionuclide
21 release.

22 For an advance reactor now, sometimes the
23 defense in depth story is different. It's often
24 different. And sometimes it's not as clear that the
25 level of defense in depth that you achieve in a light

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1 water reactor with those four echelons apply directly.

2 An example would be an advanced reactor
3 with a functional containment approach where there is
4 more credit taken for the ability of the fuel itself
5 to support the role of both the fuel integrity and
6 containment. And so you have a categorically
7 justified approach that says that the fuel really is
8 that good. So the kind of design basis or licensing
9 basis events that you look at would show that the
10 containment function is adequately met by the fuel
11 system.

12 But then if you look at the reliance on
13 the reactor trip system, it's now -- it's covering two
14 echelons of defense that used to be covered by two
15 separate functions in the light water reactor space
16 for 6303. And so the question is do you have adequate
17 defense in depth if you only have one barrier that has
18 diversity? So you have diversity.

19 You've got a system that to the best of
20 your ability to demonstrate is not subject to the
21 common cause failures. But you know there's things
22 you missed. And there's now only one barrier that's
23 really effective now, not the two, the RTS and the
24 ESFAS.

25 And so kind of a long set up to

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1 determining whether diversity is sufficient to support
2 defense in depth, since you rely on defining a defense
3 in depth model similar to 6303. And that's why I
4 didn't really see it in the DRG. Now the DRG I know
5 leverages the licensing modernization process.

6 It has its own defense in depth
7 evaluations. It doesn't run I&C defense in depth
8 models. Those are plant defense in depth. And what
9 6303 did was map the I&C architecture to the plant
10 defense in depth. And so you can then go forward and
11 do your assessments on that. So I was wondering if
12 you thought about that in terms of are there cases in
13 probably the advanced reactor world where you would
14 need to have a clear definition of defense in depth to
15 understand if diversity is sufficient to achieve the
16 safety goal you're trying to achieve.

17 MR. DARBALI: I think question, somebody
18 in the audience for advanced reactors would be better
19 prepared to answer. I'll give it a chance if anybody
20 wants to chime in.

21 DR. BLEY: This is Dennis Bley. I want to
22 follow up on that and just mention to you. I liked
23 everything Tom said and the references he had. But
24 you do have a NUREG/KM-9 which is a knowledge of a
25 NUREG on a full range of history of defense in depth.

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1 And I think that could help you out here.

2 MR. JUNG: Hi, this is Ian Jung from the
3 Division of Advanced Reactors. Member Tom Roberts
4 question about advanced reactors, I think I appreciate
5 your comment. For the advances in modernization
6 project, the difference in that adequacy evaluation
7 has a set of criteria at the plant level that's based
8 on IAEA layers of defense. I think we're trying to
9 kind of practice that and learn from (audio
10 interference) and see if that's going to work.

11 MEMBER ROBERTS: Yeah, thanks. I
12 understand that. And clearly that needs some run time
13 just like the DRG to see about all the different core
14 cases if you can call it that or come out of that.
15 But I'm thinking more in terms of 603 as a 30-year-old
16 document.

17 And I noticed in Rev. 9, you took out the
18 specific model. It's in there because it's probably
19 -- at 30 years old, it probably doesn't always work
20 for even some of the light water reactors. So it
21 makes sense to step back and make sure you've got the
22 right model.

23 I think even for BTP 7-19, there may be
24 some merit to having some sort of either an
25 expectation from the staff or maybe something written

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1 down that the applicant or the staff puts together
2 what is the defense in depth model to assess the
3 diversity against. But I don't know that you could
4 radically depart as much as some of the advanced
5 reactors do from that model. And again, one scenario
6 that occurs to me is an uncontrolled reactivity
7 addition.

8 Some of these reactors have a fair amount
9 of excess reactivity that's in the rods or drums or
10 whatever. If you were to postulate that something
11 happened to the control system, it just drove the rods
12 and drums to the end of their travel, you might get to
13 a temperature that violates all the limits of that
14 fuel system. And so in that case, you're very reliant
15 on the reactor trip system or you're reliant on some
16 other layer of diversity like there's no plausible way
17 to run the rods out without having something else like
18 an analog backup stop it.

19 So that kind of thought process is really
20 what I'm thinking. And it kind of starts with the
21 IAEA Comment 24 and the diversity supports defense in
22 depth concept. It just seems like having a clear
23 definition what defense in depth model you're using
24 which has diversity.

25 Again, it's something that's worth

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1 thinking about. Maybe I'll leave that as a question
2 to think about. We'll consider we want to put
3 something like that in the letter. Thank you.

4 MR. DARBALI: Thank you.

5 CHAIR BROWN: I'm going to be the nagging
6 nelly on this one. I've never liked trying to define
7 how many levels of defense in debt you need. You have
8 to look at circumstances as they come up and
9 determine, hey, is this -- is one going to be enough?

10 And then you -- sometimes you do one type
11 of a risk analysis. The other way, you do an
12 engineering judgment that that's based on experience
13 with those types of systems. Do we conclude that
14 that's okay?

15 I don't like being too prescriptive on how
16 many layers of something I have. But I can make an
17 argument, whether it's valid or not, that a four
18 channel reactive trip system with the same software in
19 every channel is just fine because how likely is it
20 that when you're running asynchronously that all
21 pieces of information flowing through each of those
22 four channels is going to be exactly at the same
23 place, trigger the exact same lockup, or some other
24 malfunction at the same time and take out more than
25 two channels. I'm not arguing one way or the other

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1 that you don't do something.

2 I'm just saying that trying to say you
3 always have to define or provide some additional --
4 you make judgments if you go through a design based on
5 the plant, nature of the plant, the nature of the
6 reactivity control systems. There's a lot -- margin
7 has been built into the plant that obviates the need
8 for too much additional stuff. I should argue that
9 divert different software in two as opposed to the
10 other two.

11 I'm not particularly persuaded that that's
12 all good. When you look at FPGAs, people have
13 proposed four channels with two FPGAs that are
14 volatile and two that are non-volatile. A volatile
15 FPGA dumps all of its memory and has to be reloaded
16 every time when the power comes back.

17 Well, you set yourself up for some
18 deviations to occur if it doesn't boot up properly
19 again. So why don't you use two non-volatile FPGAs?
20 I just think you have to look.

21 I don't like a lot of pre-definition for
22 each and every -- you have to look at the plant, look
23 at the systems required, and then evaluate what levels
24 you're satisfied with what you got. In the old analog
25 world, we made four channels at least that I'm

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1 familiar with that were all analog components and were
2 identical, piece part by piece part. And people would
3 opine, well, what if these two things fail?

4 Maybe it does. But I can say for sure
5 maybe other people have in. In 35 years, I never say
6 -- the closest I ever came was something to do with a
7 mechanical -- a relay that was improperly manufactured
8 in terms of cooling the laminations.

9 And the oil started squeezing out and made
10 the relays stick and could prolong the withdrawal of
11 rods when you release end hold out switch. So I'm
12 just -- I'm not trying to counter Member Roberts and
13 Dennis. I'm just trying to provide another
14 perspective which should be -- that needs to be, I
15 think, maintained for our evaluation.

16 I am in favor of doing stuff because I
17 think if you can do it and do it without pillaging the
18 system, then it doesn't cost your system to be four
19 times what it cost otherwise. You probably ought to
20 go ahead and do something because it provides an easy
21 feeling in the stomach. And you want to at least have
22 public perception to be that, hey, that you're looking
23 at stuff. So anyway, that's my soliloquy on that.
24 Pass that on since I won't be able to do it again.

25 MEMBER ROBERTS: Yeah, Charlie. I think

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1 I agree with you on a couple of things. One is I
2 don't think you'll ever come up with a mathematically
3 deterministic defense in depth model. It's not
4 something that is practical.

5 There's never true independence when
6 there's a defense in depth. There's always some
7 reliance which is kind of why you have to look at the
8 common cause failures and try to find ways to beat
9 your defense in depth. But the second thing is and
10 probably maybe a restatement of what you said is that
11 if you take a prescription like BTP 7-19 and say, I
12 met all these objectives so I'm diverse enough.

13 Well, maybe you aren't depending on what
14 the plans context is. And what do you want to call
15 that, the defense in model -- defense in depth model
16 of your plant or the engineering judgment of how this
17 all fits together. It's really the same thing.

18 It's understanding that this new concept
19 may be that the one wicket between you and really bad
20 day. And how good that wicket is, maybe I'm not
21 satisfied. And that's all process, I think, needs to
22 be in there. That's where, again, I start with NEI
23 Comment 24 because it kind of crystallized in my mind
24 there is a difference between diversity and defense in
25 depth. And this issue may go both ways.

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1 CHAIR BROWN: I will be asking that
2 question later relative to one other circumstance in
3 the -- folks with BTP. Go ahead, Norbert. I'm sorry.

4 MR. CARTE: A couple comments. So
5 sometimes we have different subcommunities within the
6 NRC. So within the PRA community and you look at
7 1.174, diversity is listed under defense in depth. So
8 it is independence diversity. Those sorts of things
9 are attributes of defense in depth.

10 In the I&C community, we've used the term
11 diversity to refer to kind of what we do differently
12 in I&C. And we've ignored the overall facility
13 defense in depth. So part of this comes to the
14 different regulating communities and how they use the
15 terms.

16 Well, let me jump onto Charlie's point a
17 little bit. So as an engineer, I agree with what
18 you're saying. But as a regulator, I hear this voice
19 in the back of my head that says, bring me a rock,
20 right?

21 So the applicants want something written
22 that we can argue against. We meet this criteria.
23 Therefore, we have sufficient defense in depth. The
24 problem is there isn't a good statement like that in
25 our regulatory requirements.

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1 And we've always made sure there was
2 plenty defense in depth, although it's not clear what
3 the regulatory basis for that is. So that's the
4 problem. There is no statement in the regulatory
5 requirements what is adequate defense in depth. And
6 that's why it gets a little confusing.

7 CHAIR BROWN: I actually agree with you.
8 We argue about prescription and allowing people to
9 propose different systems, different approaches to do
10 things. Having built and developed and managed the
11 development of probably a couple of different -- a
12 dozen different designs over 35 years, the more
13 prescriptive information you provide to a vendor or a
14 manufacturer for your system, he knows what you're
15 looking for.

16 You know what the accuracy is, time
17 response to this. You want piece parts to be rated by
18 so much or whatever the metric is. It's easier for
19 them to proceed with their design and get it done.

20 Or you could just toss -- build this to do
21 this with a blank sheet of paper. And you're
22 constantly throwing rocks back and forth across the
23 fence to see whose rocks are doing what you want to
24 get done. So there's a balance between providing
25 substantive information that the licensees are

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1 spinning around in cloud 9.

2 But that still provides for alternative
3 processes and thoughts and approaches to take and to
4 accomplish your end goals, right? It's a balance.
5 That's all I used a -- I just phrased it a little bit
6 differently. That's all. Who's next? Anybody else?

7 MR. DARBALI: So we are on slide 18. So
8 in the background section, we added some historical
9 information to the beginning. Should we discuss that
10 a little bit?

11 We restored the sentence on latent design
12 defects in the design of the I&C system. We added a
13 footnote to provide clarification to the staff on the
14 Commission direction. We removed sentences regarding
15 NUREG/CR-6303 because they did not add value to the
16 discussion.

17 We added a segmentation, the list of some
18 technique samples. And we removed references to other
19 guidance documents which are not explicitly used in
20 BTP. Next slide. And on slide 19, we are still in
21 the background section. We removed references to
22 regulations that are not specifically called for in
23 the BTP criteria.

24 We added a reference to NUREG 2122 in the
25 relevant guidance section. We removed references to

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1 SRP chapters or sections that are not used or are
2 already referenced in other parties of the BTP. And
3 we clarified that the BTP is intended to provide
4 review guidance to the staff for ensuring an
5 applications meets the policy and applicable
6 regulations. No questions, we can go to slide 20.

7 MEMBER HALNON: This is Greg. I was just
8 going to mention that last bill in the previous one is
9 a pretty important concept where people want -- they
10 want a document that fills all. We're not in that
11 place, right?

12 Maybe in three or four decades we might
13 be. But adding additional guidance, additional
14 criteria, whatnot to this, it's already included in
15 all the references. For example, the different layers
16 of defense in depth, it's pretty prescriptive.

17 You've got control, reactivity, heat
18 removal, and the operator reaction. And then you have
19 -- that's a kind of vertical approach. And you also
20 have the horizontal approach which is design control
21 and making sure you get it.

22 In this, what's good enough is going to
23 have to be a conversation because it's all new
24 technology. For the large light water reactors, we
25 have a really good feel for what's been. And we've

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1 got a lot of operators under us.

2 So it's going to have to be. And I don't
3 think we can expand this a lot further than where it's
4 at to add more and more and more guidance. So that's
5 why this last statement, it was an approach for the
6 reviewers to evaluate.

7 It's not necessarily guidance for the
8 applicants. And I think that, like, the set of
9 comments from the industry, the comments here is
10 looking for guidance from the applicant, that's not
11 what this is. So I just wanted to emphasize that last
12 point.

13 MR. DARBALI: Appreciate it.

14 CHAIR BROWN: I made that statement when
15 we had the opening statement. And it is for review.
16 However, if I was a licensee, I would like to know
17 what the staff is going to be reviewing -- looking
18 for.

19 So I don't know that you were saying,
20 don't have it available to licensees. But I think
21 stuff in the SRP is fundamentally staff review
22 guidance. Did I get that wrong?

23 MEMBER HALNON: No, I agree with you,
24 Charlie. And we want to be as specific as possible to
25 help the reviewers out as well.

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1 CHAIR BROWN: Yeah.

2 MEMBER HALNON: But right now, we have a
3 Wikipedia items criteria, things to look at,
4 knowledge, management, and all this stuff. I don't
5 think we're at the point now for the new reactors that
6 they can get real specific. It totally gets them
7 operation experience so that we know what's good.

8 Certainly, you can design redundancy over
9 redundancy and certainly never get of a control layer
10 of defense in depth. You never challenge your
11 reactivity control systems. You never have to have an
12 ESFAS system (audio interference) that away.

13 But it's too expensive. It's too much.
14 So my point is, is that there's a lot of stuff here.
15 There's a lot of stuff in the references. I don't
16 think we know all the specifics.

17 We probably know more and more each year.
18 But every time we do an application like we did
19 Kairos, SHINE, through conversation with the
20 applicant, we start learning more and more and more
21 about it. And we start talking more and more about
22 the risk numbers and whatnot.

23 But the classic PRA might not apply in
24 some new technologies. So hence, we're trying to do
25 PRAs for when these other types of reactors, some that

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1 don't even have a core like molten salt. But anyway,
2 I'm rambling.

3 But I just want to emphasize the point
4 that this is going to be an evolutionary thing. Rev.
5 9 is certainly not going to get into where we see we
6 have to be light on our feet to revise it quickly.

7 MEMBER ROBERTS: Greg, the comment I made
8 at the outset was that there's a Reg Guide for
9 diversity, defense in depth, common cause failures,
10 whatever you want to call it. And I'm kind of curious
11 is industry or the applicants have asked for something
12 like that or whether you think they had enough. And
13 I'm trying to get later to a specific question.

14 But one Reg Guide that does exist is Reg
15 Guide 1.53 which is for single failure criteria. That
16 Reg Guide is 20 years old. It endorses a 20-year-old
17 version of the single failure criterion IEEE standard.

18 And that IEEE standard says there's a
19 whole bunch of common cause failures you don't have to
20 consider. So I look at that and say, well, a design
21 basic space, that probably makes sense because you got
22 reasons why you have design criteria that addressed
23 those. And beyond design basis space, I'm not sure
24 what it means.

25 And the BTP Rev. 8 added a requirement to

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1 cover hardware common cause failures which was new.
2 And before Rev. 8, that didn't exist. So I find
3 myself wondering what that even means if I were an
4 applicant.

5 I don't know quite where to go with that
6 because my guidance says that I don't have cover these
7 common cause failures. But then Branch Technical
8 Position 7-19 says I do. That's just one example.

9 So probably -- and there is on the NRC's
10 website, there's one of those Reg Guide assessments
11 that says that's one that you think needs revision.
12 So I would tend to agree there are more up to date
13 versions of IEEE-379 that are a little clearer. And
14 I'm not quite sure where you stand on that. But it
15 kind of takes in the bigger question that this beyond
16 design basis space, what do you expect?

17 MR. CARTE: Norbert Carte, different
18 rules. So that question comes up sometimes. So what
19 Reg Guide 1.53 addresses is a single failure criteria.
20 And under the single failure criteria, you do not
21 consider CCF.

22 It's not a single failure as defined by
23 the single failure criteria. That doesn't mean it's
24 nowhere addressed anyone in the regulations. There
25 are other regulatory requirements that you have.

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1 And that's part of the introduction of the
2 GDCs. The independence criteria in the GDCs is there
3 to prevent systematic concurrent failures of redundant
4 elements, right? So there are these requirements in
5 there against CCFs, but they're not a single failure
6 criteria.

7 So what people -- industry often reads
8 that and say we don't have to consider CCF. Well, you
9 don't have to consider CCF as a single failure. You
10 do need to consider it light of other criteria. So
11 that's the clarification I would offer there.

12 MEMBER ROBERTS: Right, and where going to
13 find that isn't entirely clear. And looking at just
14 the NRC's website in terms of the reasoning of Reg
15 Guide 1.53, one of the revisions to IEEE-379
16 references IEEE-352 which has a prescription for how
17 to go assess the common cause failures in hardware.
18 And it goes on to say, but you don't need to cover
19 those as a single failure analysis.

20 Okay. I got what you just said. That's
21 a design basis assumption. And so design bases don't
22 include common cause failure and single failure
23 criterion.

24 But it seems like something in the NRC's
25 guidance would evoke that, yeah, we do expect you to

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1 do this assessment that IEEE-352 calls out. And that
2 would presumably be a feed to the BTP 7-19 assessment
3 because that would be the -- basically the give me a
4 rock, a rock that says, we looked at our common cause
5 failures and here's our story. But I couldn't figure
6 that out and look at the vacuum. It's exactly what
7 you expect.

8 MR. CARTE: Right, I agree. Our
9 regulatory guidance could be improved. So in terms of
10 another comment in terms of design bases, so first of
11 all, the design bases of a facility includes features
12 to address beyond design basis events.

13 And you'd look at 50.34(i), for instance.
14 So the design bases are the functions and values in
15 the FSAR. Now sometimes people use the term design
16 bases to refer to what's analyzed in the accident
17 analysis which are different, right?

18 So a CCF is not postulated in the accident
19 analysis. But there are other requirements that you
20 shouldn't have a CCF. And because you meet those
21 requirements, you don't need to do the analysis of the
22 CCF.

23 And independence is one of those
24 requirements. The redundant portion should be
25 independent. In other words, they shouldn't fail

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1 concurrently. Well, since that's a requirement and
2 you meet that requirement, you don't have to do an
3 analysis where they do fail concurrently. So the
4 design bases includes features to address CCF. It's
5 just that CCF is not analyzed in the accident
6 analysis.

7 MEMBER ROBERTS: Yeah, I think that makes
8 sense. But how do you get there to what the BTP 7-19
9 reviewer is looking for when they face the requirement
10 to cover hardware and Digital I&C and CCF. Is it
11 clear to the reviewer that that's the place they're
12 going to look? Or is something more intended?

13 MR. CARTE: Yeah, it takes a while to
14 train a reviewer.

15 MEMBER ROBERTS: So maybe the takeaway for
16 that, I'm personally interested in what the current
17 plan is, Reg Guide 1.53 because the item on the
18 website is almost eight years old. And it seemed to
19 be pretty well written in terms of why the Reg Guide
20 should be reviewed for revision. But I guess that
21 it's almost eight years old.

22 I'm not quite sure where that stands. But
23 it seems like that would be a way to have this
24 discussion is we look at the Reg Guide and whether the
25 later versions of IEEE-379 are consistent with some of

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1 the principles you just outlined in terms of the way
2 they refer back to common cause failure analysis.
3 That'd be probably a good place to try to put this all
4 together. Do you know where that stands?

5 MR. CARTE: Well, I think
6 organizationally, the responsibility to update the Reg
7 Guide falls within the research. So they periodically
8 evaluate the Reg Guides and determine -- and decide
9 whether they need to be updated or not, although I
10 think we could ask for a Reg Guide to be updated.
11 That's generally not in the NRR's scope.

12 MEMBER ROBERTS: I probably don't
13 understand the overall system. The assessment was
14 done in 2016. It says, this needs revision. I'm just
15 kind of curious what that means in terms of --

16 MEMBER HALNON: That's not long ago in NRC
17 specs.

18 MEMBER ROBERTS: Well, that could be.

19 MEMBER HALNON: I'm serious. That's
20 pretty -- you look at some of them are 1989.

21 MEMBER ROBERTS: So we've got a
22 subcommittee meeting I think at the end of June to go
23 over the overall progress on July. Maybe that's a
24 good topic. I'll refer that to Christina just to go
25 over what the current thought is on that Reg Guide and

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1 maybe all the other Reg Guides, 1.53.

2 There may be -- that's the one I ran into
3 when looking into this branch technical position. It
4 was referenced in the BTP. And I personally agreed
5 with the reason why the Reg Guide should be revised.
6 Kind of wonder where that stands.

7 MR. CARTE: Well, so we have targeted
8 research about that. Actually, that's sort of fallen
9 between the cracks right now. But we have said that
10 we wanted them updated.

11 What we're not sure of is exactly how to
12 update them. We have contemplated rolling the I&C Reg
13 Guides basically into one Reg Guide or not or a
14 smaller number of Reg Guides. We just haven't decided
15 exactly on the path forward on that. There is a
16 desire to update the Reg Guides. Just the exact plan
17 of how to do that has not been decided.

18 MR. PAIGE: So this is Jason Paige. So we
19 can definitely provide an update during our June 27th
20 ACRS briefing. And we just have to look at the
21 history of that periodic review that you're mentioning
22 and provide a complete story during that briefing. So
23 we'll take that as an action.

24 MR. MOORE: This is Scott Moore, Executive
25 Director. As NRR noted, the Office of Nuclear

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1 Regulatory Research has a responsibility to promulgate
2 the Reg Guides. And it also goes back and looks to
3 see when it needs to be updated.

4 They do that in conjunction with the
5 program office. And so they don't have to have
6 Digital I&C experts in research on the Reg Guide.
7 They do. But they don't have to have them there in
8 the Reg Guide group. But they have to coordinate with
9 NRR on. And then they jointly make a decision on how
10 it's going to move forward. So if you want to hear
11 the status in the June meeting, I think it would be
12 appropriate for Christina to get research to come down
13 and talk about it.

14 MR. CARTE: Thanks, Scott.

15 CHAIR BROWN: Okay. We are about to start
16 a new section. I was going to suggest that we take a
17 15-minute break and return. At that point, we will
18 begin Section B. Okay. We're in recess.

19 (Whereupon, the above-entitled matter went
20 off the record at 2:57 p.m. and resumed at 3:15 p.m.)

21 CHAIR BROWN: Okay. We're back in service
22 now. In session, excuse me. Get the words right.

23 MR. DARBALI: So this is Samir Darbali.
24 We are on slide 20.

25 CHAIR BROWN: You have to wait till I get

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1 to B.1 --

2 MR. DARBALI: Okay.

3 CHAIR BROWN: -- in the document.

4 MR. DARBALI: Okay. Let me know.

5 CHAIR BROWN: Okay. I'm ready.

6 MR. DARBALI: Okay. So in Section B.1
7 which is the introduction to the four points, we added
8 a point curve to that new overview figure we showed
9 earlier which is now at the end of the document and
10 depicts the applicable BTP sections for addressing
11 each of the four points. We further clarified the
12 discussion on points 3 and 4. And we clarified the
13 discussion on critical safety functions. Next slide.

14 In Section B.3.1. which is the use of
15 diversity within the design to eliminate the potential
16 for common cause failure, we remove the references to
17 NUREG/CR-6303 and NUREG/CR-7007 because they may be
18 seen or interpreted as review guidance which is not
19 the staff's intention. And as we have mentioned
20 earlier or it was mentioned earlier some of these
21 documents are a bit outdated. The exchange was not
22 made a direct response to NEI Comment 30 that you see
23 there. But it was a change made as we were evaluating
24 how to address that particular comment. And we also
25 rewarded acceptance Criterion C to use language

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1 consistent with SECY 1890.

2 CHAIR BROWN: Sorry, I lost track of the
3 slides.

4 MR. DARBALI: Okay.

5 CHAIR BROWN: They're double sided.

6 MR. DARBALI: We are now going to slide
7 21.

8 CHAIR BROWN: Okay, got it. All right.
9 I'm back in sync. Thank you.

10 MR. DARBALI: Okay. We were just on slide
11 21. We're going to 22. Okay. So for Section 3.1.3
12 which is the use for alternative approaches other than
13 diversity and testing to eliminate the potential for
14 common cause failure, we removed draft language that
15 had been added on the risk significance of the CCF.

16 And we also removed a pointer to Section
17 B.3.4 that had been added previously. That clarifies
18 and simplifies the discussion. We added as an example
19 of an alternative approach a well-designed watchdog
20 timer that is not dependent on the platform software
21 and puts the actuators in the safe state. And we
22 clarified acceptance Criterion A for identification of
23 --

24 (Simultaneous speaking.)

25 CHAIR BROWN: I have a comment.

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1 MR. DARBALI: Yes.

2 CHAIR BROWN: Or a question.

3 MR. DARBALI: Yeah.

4 CHAIR BROWN: On the second bullet, no
5 problem with adding. It was needed after all the
6 designs we've been through. I wouldn't call it an
7 alternative approach. I would call it a mandated
8 requirement that you all are not allowed to do.

9 But if you're missing it in any designs
10 that come in, if I was a member I would be
11 recommending, not approving the designs. Not
12 dependent on platform software, that's just fine.
13 Puts it in a safe state, that's just fine. But it
14 doesn't say it should be hardware based. It says it
15 should be not dependent on platform software --

16 MR. DARBALI: Correct.

17 CHAIR BROWN: But implies that it could be
18 a software based watchdog timer which is not really a
19 good idea.

20 MR. DARBALI: So for this particular
21 application, it would be so that you're highly unlike
22 you would have a CCF with that timer and a CCF of the
23 system. But I understand your point. That's too
24 hardware based.

25 CHAIR BROWN: It's just we've made that

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1 point in each and every one of the design approvals
2 that we've made for the last four or five from AP1000
3 through Diablo Canyon. I think there were four or
4 five design changes.

5 MR. DARBALI: Right.

6 CHAIR BROWN: One was a plant and the
7 other one were new designs. And I think we stuck with
8 that each time. Just making that point. I don't know
9 what I'm going to do with that letter-wise, right?
10 But go ahead.

11 MEMBER ROBERTS: Yeah, adding to Charlie's
12 point, I would tend to agree that one designed
13 watchdog timer is kind of a necessary element of a
14 digital control system. But I'm not sure that it's
15 sufficient. And putting it in Section B.3.1.3, an
16 example of an alternate approach would imply that you
17 think it is.

18 And I guess I'm wondering why having a
19 watchdog timer would be a substitute for diversity,
20 for all the other options that are in Section B.3.
21 And part of my thinking is the addition of digital
22 hardware common cause failures would then require you
23 to ensure the watchdog timer could get around any
24 hardware common cause failure. And I'm not sure how
25 you do that. If you use hardware, you'd postulate a

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1 hard lockup of all redundant channels from the common
2 cause failure.

3 MR. DARBALI: Right. I mean, so we added
4 as an example an applicant can propose it. But they
5 would have to appropriately justify and identify which
6 particular CCF vulnerabilities that watchdog timer is
7 intended to address. So it's an example to kind of
8 inform the reviewer. Applicants can also look at
9 this. But it would be whatever the applicant submits
10 that really has made the criteria in 3.1.

11 MEMBER ROBERTS: You're thinking it's
12 probable that an applicant could come in and say, I
13 have a watchdog timer, and no other argument for
14 common cause failures and that would be good enough?

15 MR. DARBALI: No, no.

16 MEMBER ROBERTS: Okay. Because that's
17 what I read, putting in B.3.1.3 means. They might put
18 it in a different section like maybe 3.2.1 where it
19 talks about what you would need to have diversity as
20 opposed to 3.1.3. This is a substitute for diversity.

21 I mean, a watchdog timer is sufficient.
22 That's at least what I read is putting it in 3.1.3.
23 And again, I think putting it in the baseline position
24 is a good idea. But I'm not sure it belongs here.

25 CHAIR BROWN: Here's where Tom and I would

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1 probably disagree to some extent. I don't consider a
2 watchdog timer a diversity issue. It's a device to
3 protect you against processes in lockup or whatever
4 reason, regardless of all other diversity conclusions.

5 So you could have all kinds in my opinion.
6 And you're going to have to deal with him, not me in
7 the future. So we have a small disagreement on the
8 process. To me, it is a design approach to ensuring
9 your process would work properly.

10 DR. BLEY: Charlie, it's Dennis.

11 CHAIR BROWN: Yes.

12 DR. BLEY: To me, it sounds like you're
13 saying the same thing Tom said. I don't see the
14 disagreement.

15 CHAIR BROWN: He's --

16 DR. BLEY: He said it's not adequate as a
17 substitute for diversity. I think you're saying the
18 same thing.

19 CHAIR BROWN: Well, I could argue and I'm
20 not advocating this one way or the other. Like I said
21 in an earlier comment, that you can have four channels
22 with the same software and the watchdog timer is a
23 method of saying, hey, look. If you make some other
24 assumptions, engineering judgments, about asynchronous
25 operation, not data come out of all four of the

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1 separate detectors going to them is always ever going
2 to have the same byte configuration or corruption
3 introduced.

4 And a watchdog timer is a way to ensure
5 that the processor always completes its function. So
6 it's to me without any diversity anyplace else. I'm
7 not advocating that.

8 I'm just saying to me it's part of the
9 design if you're going to use a software, a
10 microprocessor type approach. But you can argue, do
11 I need it everywhere? Just in the voting units, or
12 should I put it in every one of the processors that is
13 processing data that is then sending data?

14 I'm leaving it open. I'm just saying
15 there's -- to me, it's a hardware design issue. But
16 we don't have to settle that. I'm not going to argue.

17 I'm just planting the thought process.
18 It's not a -- to me, it's not an application of
19 diversity. Is that what you said, yes or no?

20 MEMBER ROBERTS: No, I think it fits in
21 section that's entitled diversity.

22 CHAIR BROWN: And I don't agree.

23 MEMBER ROBERTS: On the other hand, that's
24 what the section is entitled as opposed to -- it gets
25 into why you could credit the one reactor trip system

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1 you have that's officially diverse to meet the
2 objectives. And three, that's where this belongs.
3 But there may be some wiggle room on the word
4 diversity as the title's section.

5 CHAIR BROWN: I wouldn't worry about it.
6 As long as it's in the BTP, I don't care.

7 MEMBER ROBERTS: And again, my problem
8 with putting it here is it implies it's sufficient.
9 And maybe you would argue that. But I think you'd
10 have to go a lot more originating of why the software
11 isn't susceptible to common cause failure, even if
12 it's asynchronously and whether there's some potential
13 or common cause.

14 (Simultaneous speaking.)

15 CHAIR BROWN: -- where we believe in that,
16 right?

17 MEMBER ROBERTS: It depends on the
18 consequence of failure.

19 CHAIR BROWN: We ought not discuss that
20 anymore. No, I just wanted to make the point I don't
21 put it into a diversity issue. To me, it's part of
22 the basic reliable hardware design that you would
23 always incorporate where the process would create a
24 problem if it locked up. That's all.

25 MR. HECHT: This is Myron. Could I access

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1 something?

2 CHAIR BROWN: I didn't hear you. Who's
3 that? Oh, Myron. Go ahead. I'm sorry. Go ahead,
4 Myron.

5 (Simultaneous speaking.)

6 MR. HECHT: -- I'm going to try because
7 it's risk quality is not very good. All right. This
8 is the best I can do. I just want to make a comment.
9 Without a watchdog timer (audio interference) of
10 detection, not really completion of the function. So
11 you would need something warmer than the watchdog
12 timer in order to complete the function. And that
13 might be where the diversity comes in.

14 CHAIR BROWN: I agree with you. But
15 there's ways that you either generate a trip, that's
16 the thing that occurs, or you fire off an alarm to
17 tell you the processor is locked out. That's another
18 approach.

19 There are different ways to apply the
20 results. I agree with your comment, by the way, that
21 it is there to provide something and can reset the
22 entire channel, have it reboot. So I think Norbert
23 wants -- is that it, Myron? You have something else?
24 Or I'm going to let Norbert talk now.

25 MR. HECHT: No, that's fine. Let's get

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1 started for device quality.

2 CHAIR BROWN: Okay. We'll accept that.
3 Go ahead, Norbert.

4 MR. CARTE: Norbert Carte. So looking at
5 the wording in the BTP, I now see the interpretation.
6 Our understanding of technical approaches weren't
7 necessarily single measures. So the good thing about
8 diversity and testing is they are singular measures
9 that if applied are sufficient.

10 If you apply other measures, you probably
11 need to apply them in sets because different measures
12 address different sources of CCF. And so in that
13 sense, maybe this example is a little misleading in
14 the sense that we would accept the one measure. You
15 could understand to mean we would accept one
16 particular measure as being equivalent to diversity
17 which are very low safety -- on a low safety
18 significant system might increase it to the point
19 where it's good enough.

20 But that's going to be a corner case. But
21 in general, we would expect a basket of measures with
22 appropriate justification. And so maybe that example
23 is misleading in that way because I don't think -- the
24 intent was not to say that a watchdog timer is
25 equivalent to diversity. That was not the intent.

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1 CHAIR BROWN: Okay. Go on.

2 MR. DARBALI: And on the last bullet, we
3 clarified acceptance Criterion A for identification of
4 CCF vulnerabilities using a hazard analysis technique.
5 On Section B.3.1.4 which is for the use of a
6 qualitative assessment to eliminate the potential for
7 CCF, we added a footnote to clarify that the SRM SECY
8 22-0076 did not modify the SECY 18-090 reference to
9 the Risk 2022 Supplement 1. Next slide.

10 CHAIR BROWN: What's the title of that
11 risk? I've heard it before. Now I've forgotten
12 exactly what the title is.

13 MR. DARBALI: I'm looking for it.

14 CHAIR BROWN: That's okay. We don't need
15 to take up time with that. I can clear that out
16 later.

17 MR. DARBALI: Okay.

18 CHAIR BROWN: Go ahead.

19 MR. DARBALI: Next slide, slide 24,
20 changes to Section B.3.2 which is for the use of
21 diverse means to mitigate the impact of a CCF. We
22 clarified the term diverse. We removed references to
23 NUREG/CR-6303 and NUREG/CR-7007 because again they may
24 be interpreted as your new guidance which was not the
25 staff's intention.

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1 MEMBER ROBERTS: Can I offer you an
2 editorial comment on the previous slide? Printout 11,
3 I read that probably five times. I couldn't figure
4 out why you put it in there. That's why I saw the
5 slide.

6 So reading it again now that I've seen the
7 slide, there's the last line, I think, of the 15-line
8 long footnote is where it says. So you might want to
9 look at clarifying the footnote just to put that up
10 front so it's clear why you say that. I'll just leave
11 that for your consideration. Thanks.

12 MR. DARBALI: Okay. Appreciate that
13 comment. I'm on the third bullet of slide 24. We
14 removed references to 10 CFR 6069 and generic letter
15 8506 to avoid potential confusion with different
16 safety significance categorizations.

17 We added a sentence on manual control
18 connections. We added a clarification that is placed
19 in manual controls, credited as a diverse means for
20 0.3 and credited for 0.4. And we added a footnote
21 regarding the IEEE-279 and 603 requirements for
22 certain manual control. Next slide. And on slide --
23 now I'll turn it over to Steve for discussion of
24 Section B.3.4.

25 MR. ALFERINK: Thank you, Samir. This is

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1 Steven Alferink again. And I will discuss the changes
2 to Section B.3.4 in the next two slides. There are a
3 few changes to this section, all of which were made
4 for clarity. The first change clarified the language
5 to address concerns with references to SRP Chapter 19.
6 We revised Section B.3.4.

7 CHAIR BROWN: Steve, can I interrupt you
8 for a second --

9 MR. ALFERINK: Yes.

10 CHAIR BROWN: -- please? Can we go back
11 to that slide 24? Okay. It's 3.2.2, acceptance
12 criteria for manual operations. This is under the
13 section crediting manual operator action.

14 We now passed that on the next slide.
15 That's -- I have to back up. One of your acceptance
16 Criterion B was the following the criteria are met.
17 We'll conclude that the proposed manual operator
18 action is acceptable.

19 The SFC is used to support manual
20 operation or diverse from the equipment performing the
21 same function within the Digital I&C system unlikely
22 to be subject to the CCF. What happened to the
23 comment concept of independence? These are manual
24 operations. These are manual controls.

25 And I don't know how -- I'm not quite sure

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1 where this crediting manual operations come in. That
2 implies to me I go to someplace where there's a switch
3 I turn or a button I pushed. That's a manual control.

4 And is it integrated into the software
5 system? Or is it independent of the software system?
6 Because otherwise you can't credit the manual control
7 if it's subject to the system.

8 MR. DARBALI: So above the acceptance
9 criteria, a second paragraph of 3.2.2, second
10 sentence.

11 CHAIR BROWN: Which page is this in the
12 acceptance criterial?

13 MR. DARBALI: Before the acceptance
14 criteria. So go to Section 3.2.2, second paragraph.

15 CHAIR BROWN: Okay.

16 MR. DARBALI: Second sentence, it says,
17 for example, the point at which the created manual
18 controls are connected should be downstream of the
19 equipment that can be adversely affected by CCF. So
20 I think that addresses the concern that --

21 CHAIR BROWN: It's independent. I
22 understand. I was not connecting the dots. That's
23 not as clear from looking at B. I understand. It's
24 the general concept if you're going to have a manual
25 -- or be downstream of the software. I guess that's

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1 okay.

2 I had a note here. I like that paragraph.
3 And then I was taken aback by a sentence. I didn't
4 see that downstream. It seems to me part of the
5 acceptance criteria that any manual control should be
6 downstream. And that should be under the acceptance
7 criteria, not just as a statement in the text.

8 MR. DARBALI: Understood.

9 CHAIR BROWN: That's all.

10 MR. DARBALI: Okay. Thank you. Go back
11 to Steve on slide 25.

12 MR. ALFERINK: As I mentioned, the first
13 change, clarify the language, address concerns of
14 references, SRP Chapter 19. Specifically, we revised
15 Section B.3.4.1 that summarized the staff review
16 guidance in the different sections of SRP Chapter 19
17 and DC-0 ISG-28 and clarified that the reviewer should
18 follow applicable staff review guidance. The second
19 change added the discussion of the base PRA.

20 We've revised Section B.3.4.2 to include
21 a discussion of the base PRA used for the risk
22 informed B.3 assessment and update the acceptance
23 criteria to ensure the application identifies the base
24 PRA used for the risk informed B.3 assessment. In
25 addition, we added a statement that the application

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1 may identify an approved risk informed application
2 that was supported by the same base PRA which the
3 reviewer can leverage to aid in the determination of
4 a technical acceptability of the base PRA used to
5 support the risk informed B.3 assessment. A third
6 change clarified the language to address concerns
7 regarding the need to consider inter-system CCFs in
8 Digital I&C systems.

9 We revised the acceptance criteria in
10 Section B.3.4.2 to remove terminology that is not
11 typically used in PRA and clarify the modeling needs
12 to address the impact of the CCF on plant equipment in
13 multiple systems if the Digital I&C system combines
14 functions. Next slide. So we are on slide 26 now.
15 The next change clarified the acceptance criterion for
16 risk quantification associated with operator manual
17 action.

18 We've revised the acceptance criteria in
19 Section B.3.4.3 to clarify the staff's position that
20 all operator actions impacted by the CCF need to be
21 considered. The last change provided acceptance
22 criteria for determining appropriate means to address
23 the CCF. Based on the session during the previous
24 ACRS briefing, we broke the link between Sections
25 B.3.1.3 and B.3.4.4 and placed the acceptance

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1 criterion in Section B.3.4.4. And I'll hand the
2 presentation back over to Samir.

3 MR. DARBALI: Thank you, Steve. You're on
4 slide 27 for Section B.4 for meeting 0.4 of the
5 policy. We made various edits to improve the clarity
6 of the 0.4 decision and ensured consistency with SRM
7 SECY-2276.

8 We removed the reference to Regulatory
9 Guide 1.162 as it is not intended to address 0.4. We
10 removed a paragraph of long-term management of
11 critical safety functions because it did not contain
12 any acceptance criteria. And we replaced the phrase
13 risk informed critical safety functions with critical
14 safety functions which mean have been determined in
15 using risk information.

16 CHAIR BROWN: Okay.

17 MR. DARBALI: Okay.

18 CHAIR BROWN: Trying to get my phraseology
19 right here. Let's get back to the fact that 0.4 was
20 modified by the Commission which was really not an
21 overwhelmingly -- it's a different approach. We made
22 a point in our letter on main control room --
23 recognize that paragraphs 2, 3, and 4 from SECY 93-087
24 where not addressed.

25 Now you told me they are still in place.

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1 Our letter had suggested that manual backup means it's
2 critical for safety and should not be dependent on
3 software. Actually, your subsequent supplement
4 commented that the importance of uncompromised reactor
5 operator controls reinforced by events such as Boeing
6 737 MAX events which I agree with that.

7 But then when you wind your way through
8 the rest, it's still not as prescriptive. You said
9 you did not use the same prescriptive language that we
10 used in our letter. I didn't think we were
11 overwhelmingly prescriptive.

12 But then the last paragraph got modified
13 on B.1, the last paragraph. It highlighted -- it's
14 the same. It displays and controls credit for 0.4.
15 It must provide for effective manual control of
16 critical safety functions.

17 SECY 087 then had words that manual
18 hardware -- manual controls can be hardwired or be
19 diverse. You all then eviscerated that comment, that
20 sentence by saying these independent and diverse
21 displays in controls do not have to be safety related
22 or hardwired. I'm quoting that right out of your
23 text.

24 And then you can propose alternative
25 approaches. And you went on and talked about

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1 downstream as in before, second paragraph. The point
2 I get to at the end of all this, the diverse seemed to
3 be a substitute. Because it's diverse, it's going to
4 be okay.

5 Reg Guide 162 actually states that diverse
6 manual operations should be provided in the main
7 control rooms. They should be downstream so the
8 downstream is covered. Single failure still applies.

9 And the problem is the emphasis on diverse
10 essentially says do not -- since we've eviscerated,
11 you don't have to do hardware, hardwired stuff. A
12 licensee could come in and say, okay, I've got a main
13 control panel. This is part of -- it's phrased in
14 your all's text.

15 It's the Digital I&C system which is
16 ESFAS, all that other kind of fancy normal control.
17 What does diverse mean? It's fine. You can apply it
18 to a four channel system where you have diverse
19 software so you can have other mechanisms or what have
20 you.

21 But when I take 10 or 12 manual controls
22 from the main control panel that are all being
23 processed via the software in the basic Digital I&C
24 integrated system. Now you're going to provide manual
25 backups. And they can be diverse software also, and

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1 that's stated somewhere.

2 How does that get configured? If I build
3 another panel that's got diverse software and I
4 incorporate 12 manual controls that I have to have for
5 safety or safety-related, they're considered whatever
6 it is, system, ESFAS plus valves, certain pumps,
7 whatever. Now I have a separate software package
8 which is now subject to single failure because it's a
9 single package.

10 So I can lose all my controls, and there's
11 no backup at all. Effectively, you've introduced a
12 single failure. What have you destroyed? The good
13 thing about hardwired manual controls is they are
14 independent.

15 Independence is not stressed. It talks
16 about they need to be independent. But yet the
17 extensive use of diverse, another panel which has
18 diverse software.

19 Now you incorporate all the controls into
20 that. That makes it good. But is it independent
21 because it's now independent from the main control
22 panel? That doesn't fly.

23 To me, that whole paragraph, I'd have to
24 go pick out the paragraph again where we need to say
25 in my own mind it's hardwired or diverse. Any diverse

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1 system must maintain the independence of all the
2 manual controls that were initially that are being
3 reapplied via a different system. I mean, there's
4 other ways you can do it.

5 You can have a separate I&C system that
6 has four channels where everything votes. If you lose
7 this, you're still going to get something out as long
8 as everything doesn't go. Or you can put a little
9 digital processor for every control switch that's got
10 a manual switch.

11 And now I'm processing with digital
12 processing all the way down to whatever you're
13 triggering it with before. So now I've got 12
14 software systems. So I'm substituting software for a
15 50-dollar switch and 150 dollars' worth of cable. And
16 I've lost all my independence.

17 I'm struggling with how to address this.
18 I mean, there's enough other words talking about
19 independence. But yet it's difficult to see how that
20 diverse software could be interpreted as being diverse
21 from the main control Digital I&C system. And now
22 I've got my independent system which is another
23 diverse software package.

24 But all my manual controls are now
25 aggregated in that new control system whereas I've

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1 lost a lot of independence. To me, that's a serious
2 degradation of safety. That's a personal opinion, not
3 necessarily the committee opinion.

4 So I'm figuring out a way to address that.
5 I don't even know if I'll get the committee to agree
6 with me. Some would argue that Reg Guide 1.62 has
7 enough other words and providing diverse manual
8 operation instead of independent and diverse displays
9 in manual controls.

10 Well, what does that mean? That's still
11 vague because it does not -- it talks about them being
12 independent. But again, since we've got a main
13 control panel. And I just now provided another
14 software highlighted integrated panel for just the
15 manual controls.

16 So how do you differentiate that other
17 than saying that the functionality failure of any one
18 main control in this integrated, aggregated system
19 cannot impact the other -- any of the other 10 or 11,
20 whatever the number is controls. But that's also a
21 function. It's all basically one software package.

22 How do you segregate or segment it if you
23 wanted to use that terminology such that one segment
24 of the software can fail but the other one is not
25 going to. But there is still communication from

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1 segment to segment. There has to be in general from
2 timing and other data inputs.

3 I'm struggling what to do with that. And
4 I've never -- diverse has been here for Reg Guide Rev.
5 10 -- Rev. 2 which was 2010. Or Rev. 1, I think,
6 talked about diverse -- could be diverse also,
7 although there was no definition of what diverse
8 means.

9 I suspect if I walked into a plant today,
10 I'd see switches and wires going in. There'd be
11 separate rooms. They would not be integrated into a
12 common delivering system.

13 And we didn't modify O-87, although we
14 told -- one place, they said hardware -- hardwired or
15 diverse. The other place said, you don't need to do
16 hardwired. I didn't like the way you all translated
17 our comments.

18 MEMBER HALNON: I notice that Dennis
19 Bley's hand is up.

20 CHAIR BROWN: Yeah, I haven't called on
21 him yet. Dennis?

22 DR. BLEY: Yeah, I've been trying to
23 follow, Charlie, but it was long and convoluted. And
24 I lost my way.

25 CHAIR BROWN: Right.

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1 DR. BLEY: I think what you're suggesting
2 is if you offer up -- come up with a manual action to
3 solve one problem. But you have to make sure it
4 doesn't create other problems and degrade the things
5 you've already thought were good. If that's it, I
6 don't see anything in the BTP that says you don't have
7 to meet the existing criteria we can change. So I'm
8 a little confused what you're trying to get him to
9 think about.

10 CHAIR BROWN: If you had -- figure in your
11 head, say, 10 manual control switches on a panel. Now
12 you're going to use a diverse means from your main
13 control panel, okay, where they're integrated. You
14 could just have one other software developed control
15 panel. And they're all aggregated in that. And my
16 point being is the things we've lost is the
17 independence of the manual controls. That would say
18 --

19 (Simultaneous speaking.)

20 CHAIR BROWN: That would say you can't do
21 that. To me, that would say you can't do that.

22 MEMBER HALNON: Independence of the manual
23 action controls.

24 CHAIR BROWN: Yeah, that you've lost the
25 independence of independent manual because now they're

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1 all aggregated in one software based --

2 (Simultaneous speaking.)

3 MEMBER HALNON: But that in itself --

4 CHAIR BROWN: Says you won't pass.

5 MEMBER HALNON: Well, that in itself has
6 to have no common cause failure aspect as well.

7 CHAIR BROWN: Oh, some people would argue
8 that now I've got diverse software. And now since
9 it's diverse from my main control panel. But I've
10 aggregated again all my 12 controls into that new
11 thing. And it's now subject to single failure.

12 MEMBER HALNON: so the crux of the issue
13 is Charlie wants everything hardwired for backup. But
14 I mean, that's clearly probably the best way to go.
15 I think what you guys are doing is allowing some other
16 approach that meets all the criteria of being single
17 failure proof and it's not going to have the same
18 common cause failure.

19 I'm wondering if -- the common cause
20 failure, we say that's like beyond the design basis.
21 Now two common cause failures, coincident would be
22 well beyond the design basis. So I'm thinking that
23 are we trying to paralyze ourselves by saying the what
24 ifs to the nth degree that it's just going to be
25 impossible to postulate.

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1 Interesting comment because we had one of
2 our meetings we had a whole number of plant people
3 that were here. And we actually were talking about
4 manual controls and one way or another. This was
5 months ago.

6 And so I was talking with him at one of
7 the breaks. And there were four of them, I believe.
8 All four of them said, nobody in their right mind
9 would ever hardwire manual control switches down to
10 (audio interference). But that's just their thoughts.

11 MEMBER HALNON: But that makes the most
12 sense. Maybe in some of the new reactors, it won't.
13 But clearly, you can meet the criteria that way. But
14 I'm just not sure that we're in a position of saying,
15 okay, you have cascading common cause failures at the
16 same time that prevents you from implementing a manual
17 operator action. I just think that's maybe
18 unreasonable to --

19 CHAIR BROWN: Diversity does not mean you
20 can have one additional panel but all of them are
21 aggregated where a single common -- single failure --

22 MEMBER HALNON: As long as our two panels
23 are diverse.

24 CHAIR BROWN: But that's still -- if you
25 read Reg Guide 1.6, it says you have to -- any other

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1 system has to be single failure. Hardwiring is single
2 failure of one switch can fail if there's 12 other
3 switches for whatever they do. So you can always --
4 and you have to stay on one failure to do it.

5 MEMBER HALNON: Well, I take it that you
6 have 12 different functions you had to do. And you're
7 just aggregating all those different functions --

8 (Simultaneous speaking.)

9 CHAIR BROWN: You've got a manual scram
10 switch. You've got, for example, Manual SF switch.
11 Then you've got some pumps and valves you've got to
12 operate. So there's a manual. So all 12 of those are
13 separate, separate switch, separate wires going to
14 their functions. The ESFAS and RTS, they bypass all
15 the software. If the other functions have some
16 software in between, they would bypass those.

17 MEMBER HALNON: Don't we cover that with
18 redundancy and the single third proof at the FSC level
19 or if you have Train A and Train B --

20 CHAIR BROWN: Don't know. Right now it's
21 clean.

22 MEMBER HALNON: I think those are the
23 questions that would be asked if you tried something
24 like that.

25 CHAIR BROWN: I'm going to figure out a

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1 way to try to put this into the letter some way and
2 even get committee agreement. If they don't agreement
3 with me, that's fine.

4 MR. DARBALI: So if I may, I think the
5 discussion that is happening is something that is
6 still -- in the scenario that you're envisioning that
7 example, that's something that can happen with
8 Revision 8.

9 CHAIR BROWN: Oh, yes. I'm not
10 disagreeing. I agree with you.

11 MR. DARBALI: Right, so just to go back to
12 that hardwired part. So in SRM SECY 93-087, the
13 Commission said the fourth part of the staff position
14 is highly prescriptive and detailed. For example,
15 shall be evaluated, shall be sufficient, shall be
16 hardwired. So the Commission was the one that said
17 the requirement that the staff had provided back in
18 SECY 93-087 for those diverse and independent controls
19 to be hardwired, that's too prescriptive.

20 CHAIR BROWN: That's right.

21 MR. DARBALI: And then he also said, it
22 doesn't even have to be safe to relate it. So we've
23 carried that --

24 CHAIR BROWN: You carried that forward?

25 MR. DARBALI: Yeah. And so --

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1 CHAIR BROWN: And I don't have a problem
2 with that.

3 MR. DARBALI: Right. So as far as --

4 CHAIR BROWN: They changed the shell to --
5 (Simultaneous speaking.)

6 CHAIR BROWN: No, they said they should be
7 considered on a case basis.

8 MR. DARBALI: Right.

9 CHAIR BROWN: If I remember that
10 correctly.

11 MR. DARBALI: So what we do with 22-0076,
12 we kept that. The Commission and the SRM added the
13 last part. And applicant can propose an alternate
14 approach. But we haven't gone into that part in this
15 discussion.

16 CHAIR BROWN: Well, you also did address
17 that paragraph. One other approach would be a valid
18 date in the BTP where you're talking about all this up
19 in the front piece. I've forgotten where it was.

20 MR. DARBALI: So --

21 CHAIR BROWN: With 087, those items not
22 addressed in 087 are still applicable. It's --
23 diverse has been around for a long, long time. So I'm
24 addressing a problem that nobody -- in my own mind
25 that nobody has taken up before. It was there in

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1 1.62.

2 And therefore, the same thing could've
3 happened even with 087 and 1.62. I don't know what
4 Rev. 0 said. So I'm just struggling with how do we --
5 it's time to take a grasp on this and at least come to
6 a conclusion somehow.

7 MR. DARBALI: I agree with the way Greg
8 characterized it. You can correct me. That for a
9 diverse and independent visual control which has to be
10 quality and reliability are adequate for the function
11 that if we're going to postulate a CCF for that or
12 even a single failure of that diverse control system
13 at the same time as the CCF of your main safety
14 system, that really goes beyond, beyond design basis.

15 CHAIR BROWN: That's not what 1.62 says.
16 It says your other system -- IEEE applies safety
17 systems, whether control is automatic or manual.
18 That's page 4 and position 4. No single failure was
19 in the manual, automatic or common portions of the
20 protection system should prevent initiation of a
21 protective action by manual or automatic means.

22 So there's two different areas covered.
23 One is more general. One's a little bit more towards
24 the protection side. The dichotomy is there. Don't
25 know how to deal with it. But I thought I'd bring it

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1 up and let people agree or disagree.

2 To me, I think some more even in this
3 thing where it says the independence of individual
4 hardwired controls should be maintained or something,
5 whatever that means. And if you can do that on
6 software-based systems, have at it. But somehow I've
7 got main panel fails. I got 10 or 12 switches or
8 control pieces that I need to make sure the plant is
9 cooled and shut down.

10 And they're all totally independent. You
11 don't want to lose that independence regardless of the
12 diverse means you put in place to use all of the, you
13 know, to substitute. So it's that inherent
14 independence that a hardwired approach should not be
15 lost when you use a diverse approach or control
16 system.

17 MEMBER HALNON: So just a minute. Let's
18 just take it -- let's say it's one pressure injection.
19 You're saying the failure is your bravo train is dead,
20 whatever failed. Now you postulate a common cause
21 failure and control system that would've started A.
22 Not working. Now you're saying that the panel --
23 clearly if it's hardwired, you're going to get it
24 started. But you're saying that now we have to assume
25 that the backup panel is broken from a common cause

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1 failure.

2 (Simultaneous speaking.)

3 MEMBER HALNON: It's a separate -- well,
4 you've already taken --

5 (Simultaneous speaking.)

6 MEMBER HALNON: You don't take multiple
7 single failures. That's what single means. That is
8 out of bounds. So we've already taken your single
9 failure.

10 Now you're taking a common cause failure,
11 the normal system that would've started off a pump.
12 And you're saying we can't say -- I don't think that
13 -- this will be an independent system. It's not
14 susceptible to the same common cause.

15 You shouldn't have to take another single
16 common cause failure and takes out the control that
17 start the pump on the backup panel. That's what I'm
18 saying. I think it's postulating way down into the
19 realm of -- well, legally, it's not even our purview
20 to require that.

21 Now if the words don't say that in the Reg
22 Guide in BTP, then we need to make sure that it
23 doesn't imply that. But clearly, like I said,
24 hardwired is the best way to go. And that's why the
25 industry folks all say, yeah, we're going to hardwire

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1 it.

2 Because when the operator pushes that
3 button, who knows that's where to start. I think
4 we're just not used to the software running plants
5 yet. I just want to get clear.

6 That seems to me unreasonable. If the
7 words don't say that correctly, then the words are
8 unreasonable from a designer's perspective. But isn't
9 the independence -- again, it's at the train level and
10 it's at the not susceptible to the same common cause
11 level.

12 In other words, you can't -- you're
13 independent from the other system because you can't --
14 you can have the same common cause. Otherwise it
15 wouldn't be (audio interference). And then you have
16 it -- for the safety system, you have a alpha and
17 bravo train or even for reactivity control, you have
18 four channels and diverse ways of tripping rods. So
19 I'm having trouble getting it in my mind. But when
20 you come up with your words, let's talk more about it.

21 CHAIR BROWN: I figured this was not going
22 to be easy to sell. It's one of the difficulties.
23 This is not the first time. Who is that?

24 PARTICIPANT: Someone is projecting?

25 MEMBER HALNON: Did we lose it again?

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1 PARTICIPANT: Who's projecting? Did we
2 lose the feed?

3 DR. BLEY: No.

4 MEMBER PETTI: I still see the same slide.
5 Slide 27 is showing.

6 (Whereupon, the above-entitled matter went
7 off the record at 4:04 p.m. and resumed at 4:05 p.m.)

8 PARTICIPANT: A minimum of equipment. And
9 that needs to be interpreted a little bit. And the
10 other part is the historical context. So 92-087 was
11 written obviously in '93.

12 603 was incorporated in '99. So you have
13 a rule that comes after the policy. And the wording
14 in 603, that's referenced in the independence criteria
15 and a minimum of equipment criteria.

16 And the designs we're talking about, you
17 can even think of a design as being split up into
18 three pieces. Say a bistable piece where you have a
19 sensor and bistable, then you have a voting piece.
20 Those can be on separate boxes. And then once you
21 generate a voted signal like containment isolation,
22 containment spray, safety injection, you have a
23 separate system that implements that.

24 So at what point does the -- which CCF are
25 you worried about? Are you worried about a CCF in the

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1 bistable -- or the sensor and bistable processor in
2 which case your manual input goes into the your voter.
3 Or are you worried about a CCF in your digital voter,
4 right?

5 So if it's a digital voter and it locks
6 up, it doesn't matter. Both the bistables and the
7 manual controls are bad. Well, okay, what if it goes
8 directly to the implementation processor?

9 Well, if the implementation processor has
10 two channels, one from the automatic system and one
11 from the manual system, what about a CCF in the
12 implementation processor, the a diesel sequencer, for
13 instance? You could have the automatic system fail to
14 tell the diesel to start. Or you can have the
15 automatic system work and the manual system work but
16 the diesel has the CCF.

17 So it's a complicated issue and it will
18 require engineering judgment. And it would be -- I'm
19 not sure that we could come up with criteria in this
20 BTP to cover all design options. And so I think there
21 will be some engineering judgment in the application
22 of the design criteria and other standard incorporated
23 by reference.

24 I think it's you're either prescriptive
25 and say it's hardwired which the Commission didn't let

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1 us do. Or you're flexible and will require
2 engineering judgment. And we're sort of in that
3 latter space.

4 CHAIR BROWN: One way to look at me how I
5 came to this is that I read the -- multiple times,
6 I've read the 087. And I looked at it and I didn't
7 really overwhelmingly disagree because it just said it
8 should be considered on a case basis based on the
9 design. I could accept those.

10 Then I got to BTP 7-19 where in mine it
11 says you don't have to do it. Or it says you do not
12 have to use -- you do not have to use hardwired. I
13 could quote the words. I've got them in here
14 somewhere as part of the BTP.

15 A totally different way of framing it as
16 opposed to you have hardwired or diverse. Determine
17 that based on a case by case basis. And I've been
18 reading that now for 16 years. And now the words
19 change which effectively puts a different color of
20 lipstick on the pig.

21 MEMBER HALNON: It doesn't preclude
22 hardwiring.

23 CHAIR BROWN: Yeah, but it kind of says
24 you don't have to do it.

25 MEMBER HALNON: But if that's the most

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1 preferred way, most designers do that.

2 CHAIR BROWN: There's a lot of things, as
3 has been a reviewer of design.

4 MEMBER HALNON: Well, I mean, the
5 conversation we had, the bring me a rock issue on
6 uncertainty, that would take that part of the equation
7 out of it. The regulatory process, if you came in and
8 said, well, it's diverse because it's hardwired. So
9 I mean, it's a choice.

10 CHAIR BROWN: Oh, I agree with that.

11 MEMBER HALNON: It's a choice. It's a
12 choice.

13 CHAIR BROWN: It's also cheap.

14 MEMBER HALNON: Well, I don't know if it's
15 the 150 bucks for cable.

16 CHAIR BROWN: Oh, it doesn't matter. A
17 lot less than two million, another software design, or
18 the five million or whatever it costs these days.

19 MEMBER HALNON: Anyway, I mean, it does
20 open up the choice early on, on the designer's
21 perspective. Do I want to go, for lack of a better
22 term, fight this with a regulatory person to convince
23 them it's diverse enough? Or do I just say hardwired
24 and there's no question?

25 CHAIR BROWN: The other question that

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1 comes up is, how often do you exercise the backup
2 manual control panel? Do you do that quarterly,
3 semiannually to make sure all the switches work? Or
4 are you going to do that -- the problem with a diverse
5 system that's all software based, you're not using it
6 all the time. You have no idea what it's doing.

7 MEMBER HALNON: You can start with the
8 remote shutdown panel system. It's not -- I don't
9 recall the surveillance frequency on them. But they
10 do exercise (audio interference).

11 CHAIR BROWN: Anyway, I wanted to just
12 voice the concern. As you can see, we have divergent
13 views on how it should be interpreted.

14 MR. DARBALI: I just wanted to note on the
15 issue of not having the requirement for independence,
16 the six acceptance criteria, acceptance Criterion Item
17 F says --

18 CHAIR BROWN: Oh, yeah. I agree with
19 that. I don't disagree with Item F. It's still --
20 but it's --

21 MR. DARBALI: It requires them to be
22 independent and diverse.

23 CHAIR BROWN: Yeah. Or independent and
24 diverse from the equipment performing the same
25 function with the proposed DI&C systems which are new

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1 terminology. And like I say, diversity has a lot of
2 different flavors. They can be all hardwired. That's
3 diversity.

4 They can be all aggregated into one new
5 brand new integrated software panel which now carries
6 its own -- in spite of Greg's protest to common mode
7 failures. I do not trust software for basic reactor
8 safety additions in both normal and backup
9 circumstances. All the right words are in there.
10 Bypass software.

11 But if you create a new software bypass
12 how did you bypass software, downstream of software.
13 New system would not be downstream of software. It'd
14 be creating its own software.

15 Got to remember that and put it in the
16 letter. I'll have to counter your discussion.
17 Anyways, that's the purpose of these discussions,
18 bring issues up and their thought processes up.
19 There's a hand that's up. Whose hand is up?

20 MR. DARBALI: I think that's the cursor.

21 CHAIR BROWN: Oh, is that -- so you're out
22 of control over there, Greg? All right. Go ahead.

23 MEMBER ROBERTS: Just maybe a closing
24 observation. I think the DRG is a lot clearer on
25 this. It's another example of when you get to

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1 singling up on one guidance document, here's one where
2 maybe the DRG is clearer description of what the
3 overall goals is.

4 CHAIR BROWN: What does it say?

5 MEMBER ROBERTS: It says the reviewer to
6 confirm the manual controls are independent and
7 diverse --

8 CHAIR BROWN: You're going too fast. My
9 brain --

10 MEMBER ROBERTS: The reviewer to confirm
11 --

12 CHAIR BROWN: What did you say?

13 MEMBER ROBERTS: The reviewer to confirm
14 the manual controls are independent and diverse from
15 the Digital I&C safety systems, parenthesis, e.g.,
16 simple, dedicated, discrete, hardwired logic
17 components, end parenthesis. And then it goes on from
18 there. But by putting an e.g., it clearly expresses
19 as a preference. That's not a requirement which is
20 consistent with what Charlie has been saying about
21 putting the first solution forward first and then
22 allowing the flexibility that the Commission asked for
23 30 years ago.

24 CHAIR BROWN: I did not like the words,
25 you do not have to. I prefer the words that were

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1 similar in the previous -- similar to that. It's just
2 a different flavor enhancer and it carries a certain
3 amount of -- if I was a designer, I would look at that
4 and say, it's going to be easier to get acceptance of
5 this than that. So all right.

6 MR. DARBALI: Okay. So we are now on
7 Slide 28.

8 CHAIR BROWN: There are two slides. What
9 did I do with them? Here they are.

10 MR. DARBALI: So to summarize, the staff
11 provides BTP 7-19 to incorporate SRM SECY 22-0076. We
12 made changes after the September briefing in response
13 to public comments and feedback received from ACRS
14 members. We also made clarifications throughout the
15 BTP. And most importantly, there were no substantive
16 changes made to the analysis of the technology for the
17 acceptance criteria in the BTP. Next slide.

18 CHAIR BROWN: Go ahead.

19 MR. DARBALI: Okay. And so our next
20 steps, we are scheduled to brief the full committee on
21 March 6th. And we are still trying to reach for the
22 final BTP in May. And that concludes our
23 presentation.

24 CHAIR BROWN: You might address this last
25 discussion in your presentation on the full committee.

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1 Even though everybody is here, you've had time to
2 think about it. And I think if we're going to have a
3 discussion on it, since all the other members,
4 particularly Dennis and some of the other risk people.

5 MEMBER HALNON: I've shot all my bullets
6 for you guys. You'll have to put up with --

7 CHAIR BROWN: Can we get a copy of the
8 transcript pretty quick -- very quickly for them,
9 okay, as well as us. Okay. Thank you. Oh, I guess
10 my suggestion would be to -- of all the discussions,
11 there was one. Did you get your ones on the risk
12 informed or the non-light water?

13 MEMBER HALNON: Yeah, Tom. You mentioned
14 a couple times when you made some suggestions and some
15 maybe a little bit stronger than suggestions that you
16 might want to summarize those, at least --

17 CHAIR BROWN: This is the only one I --
18 (Simultaneous speaking.)

19 MEMBER ROBERTS: I think if I -- I'll go
20 by my list coming in of four items. I think it's
21 still the same four. The first one is a question I
22 asked at the outset is whether there's anything from
23 public comments or discussions about the -- that would
24 change the DRG or be considered, somebody applicable
25 to advanced reactors that you had and those you

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1 considered.

2 So even if it doesn't change the PRG, it
3 factors back into the review team so they understand
4 what came out of the public comments in this
5 discussion as well as the question of the long-term
6 vision of the DRG and the BTP, what your thoughts are
7 in terms of delivering that into a Reg Guide or a
8 simple guidance. They have a guidance document or
9 something else, whatever your thought is. So that's
10 one area that they could talk about at the committee
11 meeting in two weeks.

12 Second one was they had on the model
13 defense in depth, again, primarily for advanced
14 reactors and not looking for mathematically self-
15 consistent model that you could put through a
16 calculator. But just the overall guide for what
17 you're judging your diversity against in terms of the
18 defense in -- it's diversity adequate for the defense
19 in depth. It starts with what's defense in depth
20 model and some thoughts, especially with some of the
21 concepts that are quite a bit different from the light
22 water reactor work, what's the foundation for this
23 BTP.

24 Third one is potentially editorial. But
25 for Steve to take a look at that 3.4.4 section to see

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1 if it really says what the intent is. I don't think
2 it does, but take another look and see if there's some
3 clarification required to get it to say what you meant
4 to say.

5 And the fourth one has to do with maybe
6 independent of the cycle position. But just the
7 overall expect changes for hardware common cause
8 failures and to have that factor into Reg Guide 1.53
9 and the work there. And my view is two weeks is
10 probably not a reasonable time to come up with a
11 position on that. The meeting they have in June is
12 probably the right time to cover that.

13 And it's very -- nothing in Rev. 9, I
14 don't think the change is there. That was added in
15 Rev. 8. And so I think that's really an independent
16 discussion, but it's probably worth just making clear
17 what it is. This one thing is an issue that's worth
18 talking about then.

19 MEMBER HALNON: Good summary. I had a
20 couple housekeeping items. I just wanted to check and
21 make sure that I understood. In the background
22 section, Dennis said that all license facilities are
23 considered to have sufficient design features to
24 address CCFs, especially with the designs. Is that
25 back to what you were talking about, Norbert? Or it's

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1 beyond design basis that we're assuming?

2 MR. CARTE: I guess the concept is the
3 fact that they have a license means we have determined
4 they have adequate defense in depth.

5 MEMBER HALNON: More adequate protection
6 of safety.

7 MR. CARTE: Right. So the question is
8 when they make a change to the facility and have a
9 different architecture of their systems or use a
10 different technology. That's part of this discussion.
11 What other things do they need to consider? And they
12 need to consider only defense -- only additional
13 defense in depth to address the new hazards introduced
14 by the new design or the new technology.

15 MEMBER HALNON: Okay. And if there's some
16 issue with the design, that's going to be handled in
17 the traditional inspection oversight process. They're
18 not making a change. Or during their change you
19 review and you see something, hey, that design of that
20 system doesn't have the appropriate --

21 MR. CARTE: Well, there's a backfit
22 criteria for that. So if we approved it in --

23 MEMBER HALNON: That's what I meant.

24 MR. CARTE: -- we now don't like it.

25 MEMBER HALNON: Normal oversight, it'd

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1 have to be a violation and/or something like that.

2 MR. CARTE: We would compare it to a
3 backfit criteria to see if it crossed threshold.

4 MEMBER HALNON: That's where I was going
5 with that. On the next page, it talks about the
6 evolutionary and (audio interference). In accordance
7 with Commission direction and NRC staff SRM of SECY
8 93-087, it says the NRC typically considers CCF and
9 the I&C systems beyond design basis. And we talked
10 about that earlier. When is it no? It says
11 typically. I mean, that gives me this opening of
12 saying, well, when is it atypical?

13 MR. CARTE: Right. So the assumption that
14 CCF is beyond design basis makes a -- it's written in
15 a certain context in that you have requirement
16 independent. Redundant portions of a safety system
17 are independent and that you follow a QA program. So
18 you have all these other requirements that you rely
19 on.

20 And because of all these other
21 requirements, CCF is beyond design basis. So the
22 question then becomes, well, if you were to eliminate
23 or erode those other requirements, you're right. I
24 won't point you across the threshold and should you
25 consider CCF within design basis.

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1 And we haven't figured that out. But
2 there's always that potential. It's not beyond design
3 basis. You can change everything else no matter what
4 you do. CCF is beyond design basis. No, that can't
5 be true.

6 MEMBER HALNON: So what was the purpose of
7 adding the word typically? Is that just to give you
8 that out just in case?

9 MR. CARTE: Basically, yes. So what
10 happens is often people look at one statement and take
11 it out of context. And first of all, inasmuch -- the
12 Commission statement was inasmuch as. It didn't just
13 say simply CCF is beyond design basis. So that lifts
14 some room for when is it and when is it not beyond
15 design basis.

16 MEMBER HALNON: Rather than transliterate
17 it, you translate it into -- okay. That's fine. I
18 wanted to make sure that I understood that it wasn't
19 something else like a design coming through that you
20 say, hey, that common cause failure could be within
21 the design basis. But I understand what you meant.
22 It's almost like a problematic defense in depth of all
23 these things.

24 MR. CARTE: Right. This statement was
25 made within a context. If you change the context, the

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1 statement may no longer be valid.

2 MEMBER HALNON: Okay. I got it. Thanks.
3 That's all I got.

4 CHAIR BROWN: And one other one relative
5 to 087. Under your relevant guidance, you do list
6 SECY 931-087. And then you talk about the 22-076.
7 And you talk about the SRMs at 22-0076.

8 I would just suggest that under the bullet
9 for the 087 that you just note in there that positions
10 not modified by SECY -- or SRM whatever it is until --
11 I mean, still apply whatever the appropriate words
12 are, just to make it clear that that's still relevant
13 to the overall processes. So there's a lot of stuff
14 in that 2Q -- page 18, Section 2Q, that are
15 applicable, okay, in the last three paragraphs.

16 (Simultaneous speaking.)

17 MEMBER ROBERTS: And actually to follow up
18 to Greg's comment on the word typically. So footnote
19 3 of the document has a sentence that says typically
20 when the NRC uses the term, beyond design basis, it is
21 prior to stipulating particular criteria or a
22 particular situation. It's probably where that
23 sentence came from. It doesn't seem like that's
24 necessary true.

25 MR. CARTE: Well, if you look at practices

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1 like SBO, so every once in a while, the NRC says, this
2 is beyond design basis and then do X, Y, and Z. So
3 whenever we specifically talk about events that are
4 beyond design basis, we stipulate particular criteria
5 for those events. So the problem is a difference
6 between, say, binary thinking and trinary thinking.

7 So there's design basis events, beyond
8 design basis events, and then events not considered,
9 right? So there are some beyond design basis events
10 that are considered. And as 50.34(i) says that you
11 have design basis features to address beyond design
12 basis events.

13 So some beyond design basis events are
14 addressed in the FSAR in the application and some are
15 not. Primary vessel breach is not addressed. So we
16 talk about in a binary sense of design basis, beyond
17 design basis.

18 And it's really a trinary concept: design
19 basis, beyond design basis, and not considered. And
20 I'm trying to elicit or enlighten in that area. And
21 particularly whenever you see, like, ATWS being
22 discussed, it says beyond design basis and then do
23 these criteria. And so it's how we -- it's a practice
24 we engage in. But I don't know if it's summarized
25 anywhere else.

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1 MEMBER ROBERTS: I was thinking about
2 action mitigation alternatives that are required by
3 the 10 CFR 51. And there's pretty much a general
4 requirement that at some point as part of the EIS the
5 -- you asked me the assessment of the cost benefit of
6 various action management alternatives. And that
7 didn't seem to me to fit this definition.

8 (Simultaneous speaking.)

9 MEMBER ROBERTS: That's why this stanza
10 maybe could be deleted. It doesn't seem to add
11 anything either.

12 MR. CARTE: I'll think about that. But
13 the problem is I'm trying to get people out of this,
14 it's beyond design basis. Therefore, we don't
15 consider it. And --

16 MEMBER ROBERTS: I agree with that.

17 MR. CARTE: And maybe that sentence
18 doesn't convey the message properly. But that's what
19 I was trying to do.

20 CHAIR BROWN: Everybody -- all members
21 that are online, anybody else have any comments or
22 things they'd like to say?

23 I waited 15 seconds. I hear nothing. Is
24 there anybody on the public lines right now that would
25 like to make a comment relative to this meeting?

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1 MEMBER HALNON: Just if you do have a
2 public comment, just unmute your mic and state your
3 name and affiliation if appropriate and state your
4 comment.

5 CHAIR BROWN: Hearing none --

6 MEMBER PETTI: Can we test if there's
7 someone from the public we can hear the public. Can
8 we just get someone from the public to say hello?

9 CHAIR BROWN: That's a good idea.

10 MR. BURKHART: Hello. This is Larry
11 Burkhart.

12 CHAIR BROWN: Good. The line is working.
13 Thank you.

14 MR. BURKHART: I'm virtual, not public but
15 virtual.

16 CHAIR BROWN: Okay. Thank you. At least
17 we know it works. With that, any additional?

18 MEMBER HALNON: No, I want to thank you.
19 You did a great job today, a lot of good information.
20 I look forward to the full committee meeting and then
21 learning more in June as you come back. So I really
22 appreciate the work you put into this. Thanks.

23 CHAIR BROWN: I've lost my train of
24 thought. Where are we? Do you got anything else?
25 You're done? Yeah, I wanted to go ahead and thank

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1 you.

2 Another enlightening Digital I&C
3 subcommittee meeting with plenty of issues and
4 agreements and disagreements, the back and forth which
5 is always entertaining and fun. And other thing, it's
6 nice to see some young folks starting to come up
7 through the ranks. You're not a young folk. I'm the
8 young folk here.

9 But it was a good briefing, a good
10 discussion. It was nice that you were able to answer
11 the questions. That's even better. And it just
12 demonstrates the value of our in-person meetings as
13 opposed to -- we could've never I don't think achieve
14 the depth of which we discussed today without having
15 you all show up personally.

16 So as a subcommittee chairman, I much
17 appreciate your all's personal appearances here today
18 as well as senior staff to maintain continuity and to
19 take care of the slides and stuff. So I think it was
20 very productive, much appreciated. And we will see
21 you on -- well, whatever it is in March, when it's
22 March full committee week. We are recessed. No,
23 we're adjourned.

24 (Whereupon, the above-entitled matter went
25 off the record at 4:31 p.m.)

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SRM-SECY-22-0076 Implementation: Branch Technical Position 7-19, Revision 9

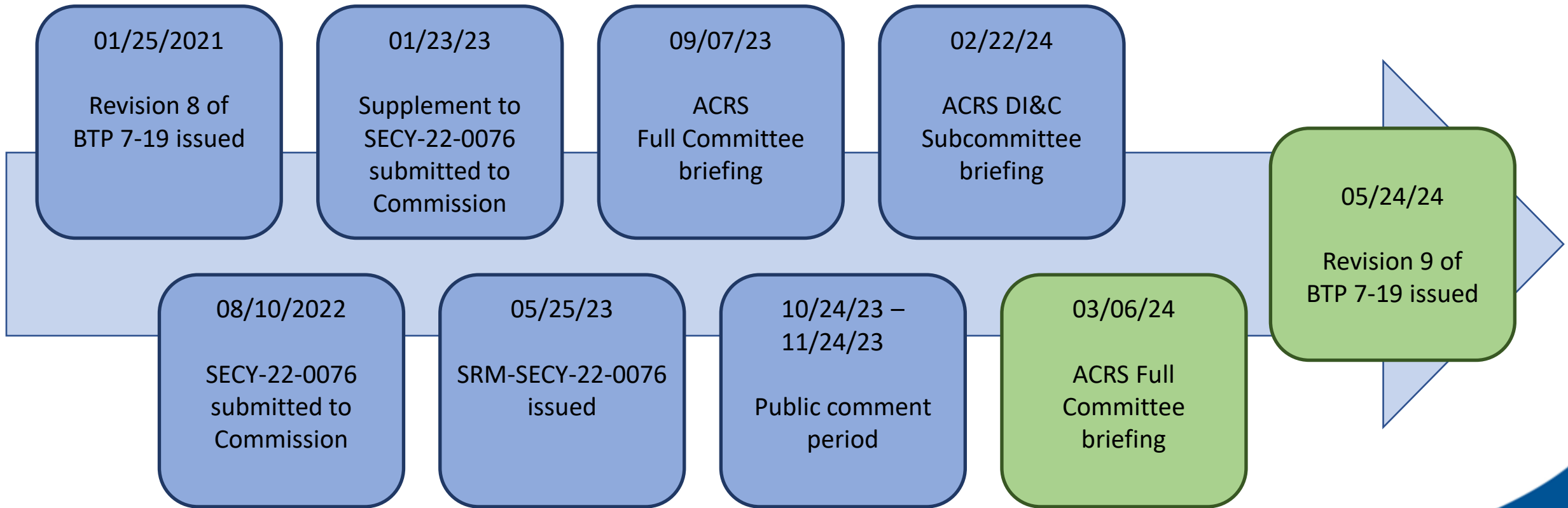
**Advisory Committee on Reactor Safeguards
Digital Instrumentation & Controls Briefing
February 22, 2024**

Opening Remarks

Presentation Outline

- Background
 - Timeline
 - SRM-SECY-22-0076 Direction and Staff Response
- Changes from Revision 8 to Revision 9
- Changes since the September 7, 2023, ACRS Briefing
- Key Messages and Next Steps
- Closing Remarks

Recent Activities



SRM-SECY-22-0076

- The Commission approved the staff's recommendation to expand the existing policy for digital I&C CCFs to allow the use of risk-informed approaches to demonstrate the appropriate level of defense-in-depth, subject to the edits provided
- The Commission directed the staff to clarify, in the implementing guidance, that the new policy is independent of the licensing pathway selected by the reactor licensees and applicants
- The Commission directed the staff to complete the final implementing guidance within a year from the date of the SRM (May 24, 2024)

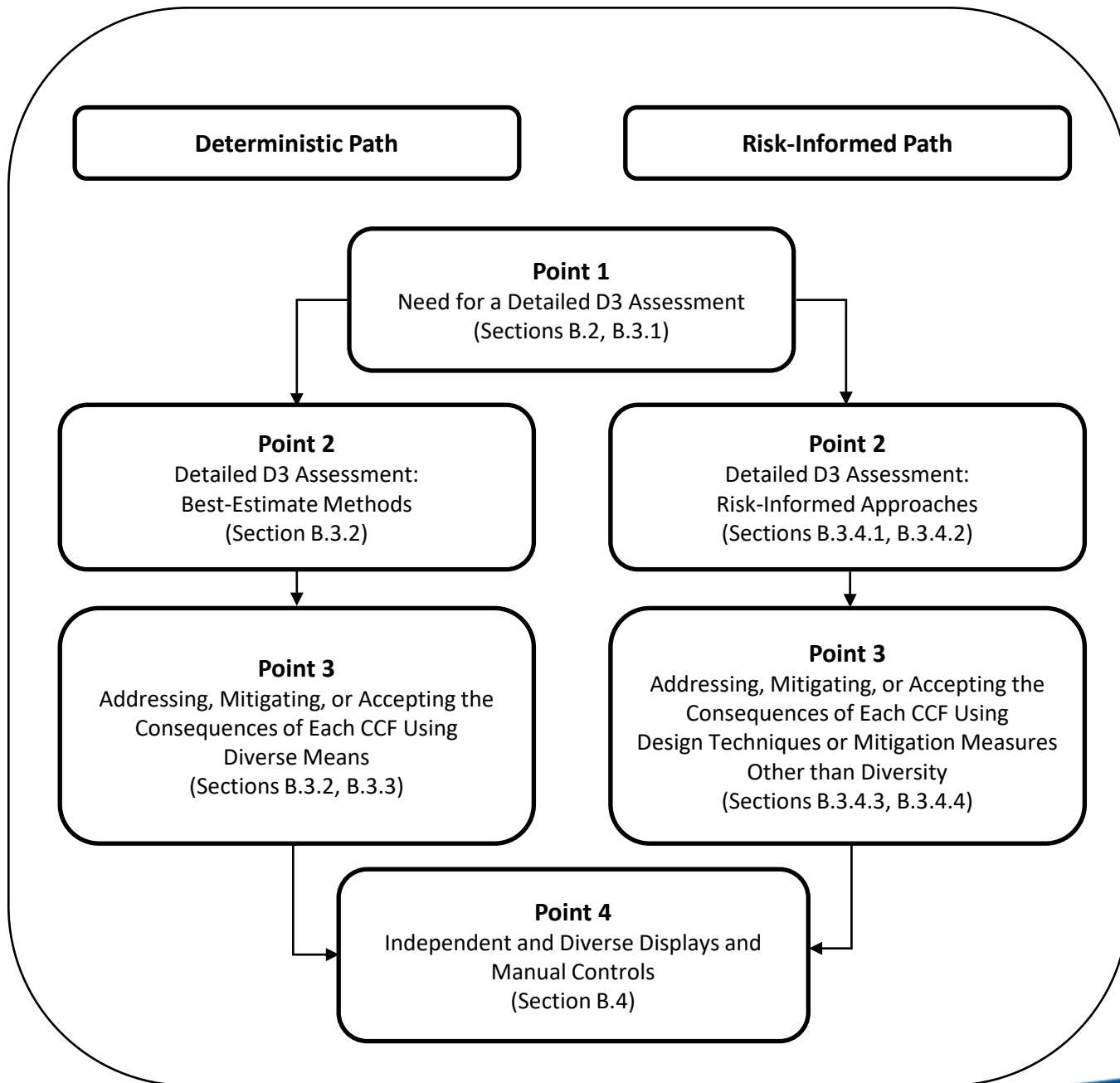
Staff Response to Meet the SRM

- Drafted Rev. 9 to SRP BTP 7-19
 - Allows the staff to review risk-informed applications
 - May result in use of design techniques other than diversity
 - Focused the revisions on implementing the expanded policy
- Staff briefed the ACRS Full Committee on September 7, 2023
- Staff received and dispositioned public comments

Substantive Changes to BTP 7-19 (Rev. 8 – Rev. 9)

- Revised Section B.1.1 to reflect the updated four points in SRM-SECY-22-0076
- Revised Section B.1.2 for clarification of critical safety functions
- Revised Section B.3.1.3 for evaluation of alternative approaches
- Added Section B.3.4 for evaluation of risk-informed D3 assessment
- Revised Section B.4 for evaluation of different approaches for meeting Point 4
- Added five flowcharts to facilitate the review
- Added language from RG 1.152 to address a prior commitment to ACRS regarding communication independence and control of access

Overview of BTP 7-19, Revision 9



Changes to Sections B.1.1 and B.1.2

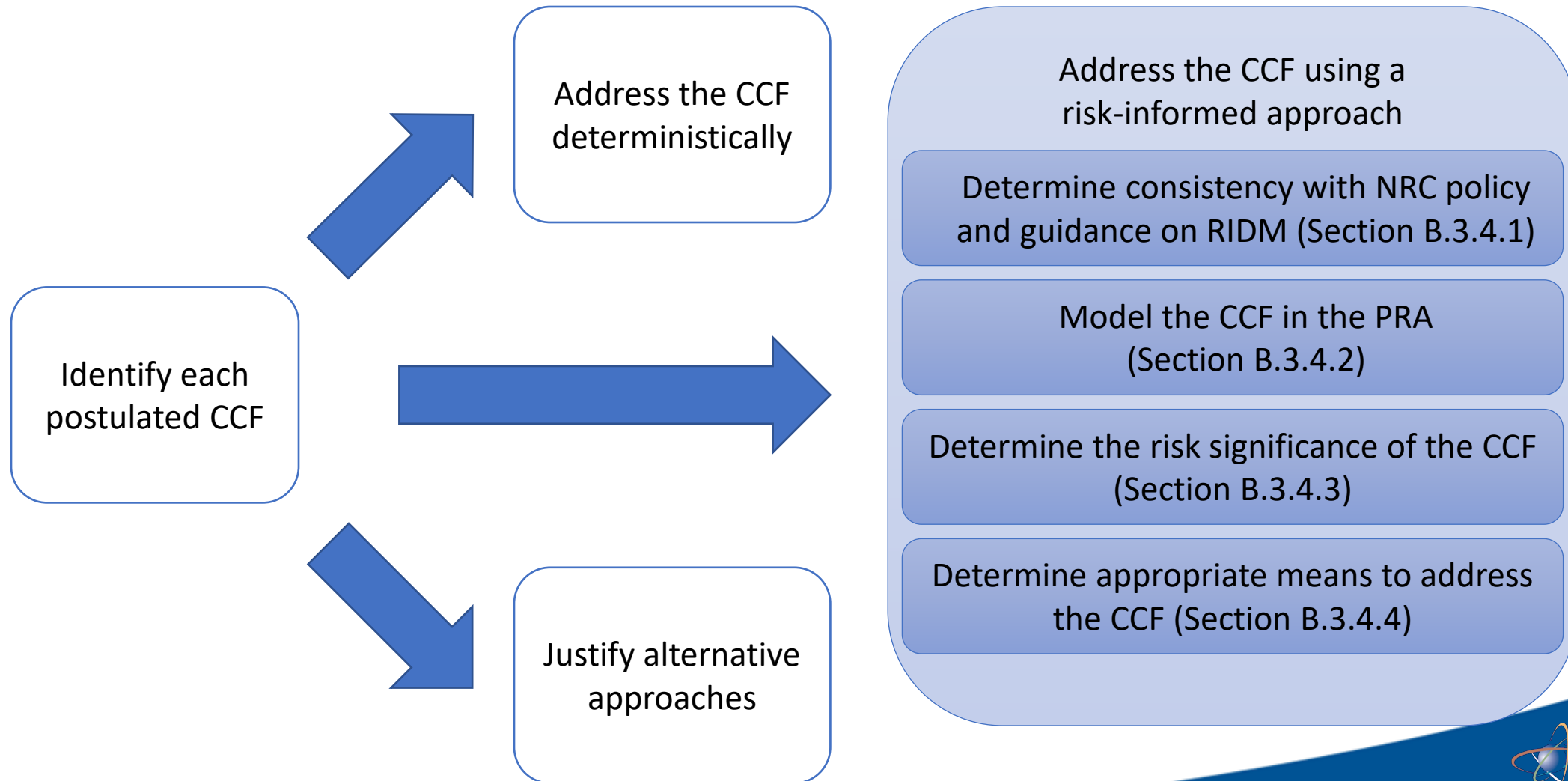
- **Updated Four Points of the Policy (Section B.1.1)**
 - Replaced the four SRM-SECY-93-087 points with the SRM-SECY-22-0076 points and updated the explanation of the points
- **Critical Safety Functions (Section B.1.2)**
 - Clarified the term “critical safety functions” and that the list of these functions in SECY-22-0076 are examples representative of operating light water reactors
 - Clarified that other types of reactors may have different critical safety functions based on the reactor design safety analysis
 - The identification of such functions may be risk-informed

Alternative Approaches (Section B.3.1.3)

Two Pathways for the evaluation of alternative approaches other than diversity and testing to eliminate the potential for CCF from further consideration

- Previous endorsement or approval
 - Ensure it is applicable
 - Ensure it is followed
 - Justify any deviations
- A new approach proposed as part of an application
 - Use the acceptance criteria in BTP 7-19
 - Review description of vulnerability being addressed
 - Review description of alternative approach and justification

Risk-Informed D3 Assessment Process (Section B.3.4)



Risk-Informed D3 Assessment

Determine Consistency with NRC Policy and Guidance on RIDM

- Review applications that use risk-informed approaches for consistency with established NRC policy and guidance on RIDM

Model the CCF in the PRA

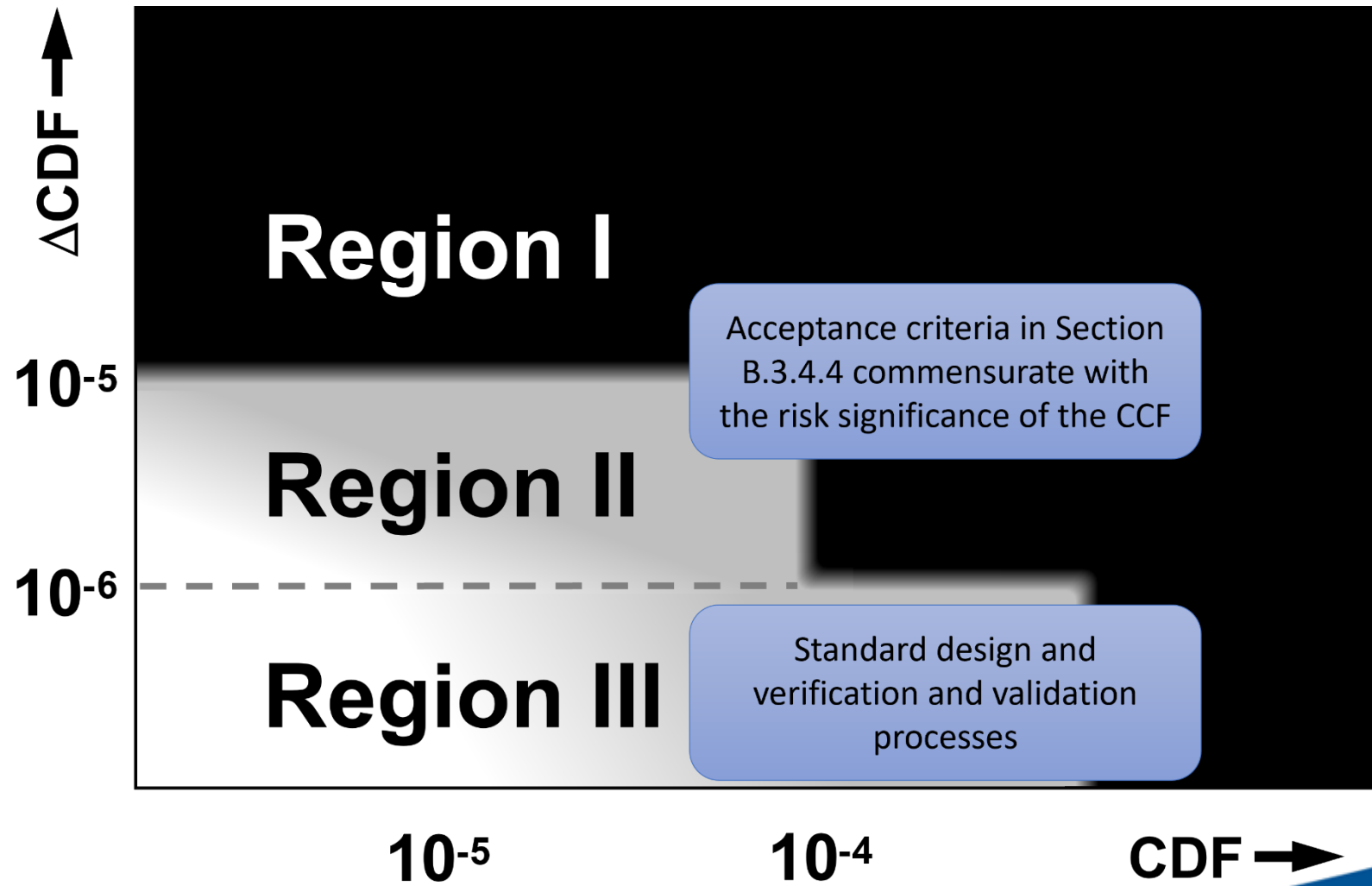
- Determine if the base PRA meets PRA acceptability guidance identified in the application
- Evaluate how the CCF is modeled in the PRA and the justification that the modeling adequately captures the impact of the CCF on the plant

Risk-Informed D3 Assessment

Determine the Risk Significance of the CCF

- The risk significance of a CCF can be determined using a bounding sensitivity analysis or a “conservative” sensitivity analysis
- A bounding sensitivity analysis assumes the CCF occurs
- A “conservative” sensitivity analysis assumes a probability less than 1
 - Provides a technical basis for a conservative probability of the CCF
 - Demonstrates that all principles of RIDM are addressed
 - Addresses the impact of this assumption on PRA uncertainty
- A CCF is not risk significant if the following criteria are met:
 - The increase in CDF is less than 1×10^{-6} per year
 - The increase in LERF is less than 1×10^{-7} per year

Risk-Informed D3 Assessment



Approaches for Meeting Point 4 (Section B.4)

- Section B.4 provides six acceptance criteria for independent and diverse main control room displays and controls for manual actuation of critical safety functions
- Applications that propose a different approach (i.e., one that does not meet all the acceptance criteria in B.4) provide appropriate justification

Changes to BTP Since Previous ACRS Briefing

- Clarifications made throughout the BTP to address:
 - Public comments
 - Discussions during the September 7, 2023, ACRS briefing
 - Comments from Member Brown and Member Roberts (attachment to transcript)
- No substantive changes made to analysis methodologies or acceptance criteria

General Changes to the BTP

- Revised the BTP to consistently use the term “digital I&C system” instead of the multiple variations of the term (e.g., “digital safety system,” “I&C equipment,” “I&C systems,” “digital I&C system or component,” “digital technology,” etc.)
 - This also ensures the BTP uses language consistent with SRM-SECY-22-0076 (NEI 1)
- Replaced “point X of the policy” with “point X of SRM-SECY-22-0076” to clarify which point is being referred to (NEI 18)
- Revised the BTP to consistently use the term “defense in depth and diversity” (NEI 24)

Changes to Section A. Background

- Added historical information at the beginning of the section
- Restored the sentence on latent design defects in the design of the DI&C system (ACRS Member Comment 8a)
- Added footnote 3 to provide clarification to the NRC staff on the Commission direction
- Removed the sentences regarding NUREG/CR-6303 because they did not add value to the discussion
- Added “segmentation” to the list of design technique examples (NEI 26)
- Removed references to other guidance documents which are not explicitly used in the BTP (NEI 1)

Changes to Section A. Background

- Removed references to regulations from the Regulatory Basis section that are not specifically called for in the BTP criteria
- Added a reference to NUREG-2122 in the Relevant Guidance section (ACRS Member Comment 3)
- Removed references to SRP chapters or sections that are not used or are already referenced in specific parts of the BTP
- Clarified that the BTP is intended to provide review guidance to the NRC staff for ensuring an application meets the policy and applicable regulations (i.e., it is not intended as guidance to applicants for developing a D3 assessment) (NEI 2)

Changes to Section B.1

- Added a new figure at the end of the document depicting the applicable BTP sections for addressing each of the four points in SRM-SECY-22-0076 (NEI 2)
- Clarified the discussion on Points 3 and 4 of SRM-SECY-22-0076 (NEI 1, 10, and 11)
- Clarified the discussion on critical safety functions in Section B.1.2 (NEI 12)

Changes to Section B.3.1.1

- Removed references to NUREG/CR-6303 and NUREG/CR-7007 because they may be interpreted as review guidance, which is not the staff's intent (NEI 30)
- Reworded acceptance criterion c. to use language consistent with SECY-18-0090

Changes to Section B.3.1.3

- Removed language that was added on risk-significance of the CCF and the pointer to B.3.4 (discussions during ACRS DI&C SC briefing)
- Provided “a well-designed watchdog timer” as an example of an alternative approach (NEI 16)
 - Not dependent on the platform software
 - Puts the actuators in a safe (i.e., actuated) state
- Clarified acceptance criterion a. for identification of CCF vulnerabilities using a hazards analysis technique (NEI 3)

Changes to Section B.3.1.4

- Added a footnote to clarify that SRM-SECY-22-0076 did not modify the reference to RIS 2002-22, Supplement 1, in SECY-18-0090

Changes to Section B.3.2

- Clarified the term “diverse” (NEI 17)
- Removed references to NUREG/CR-6303 and NUREG/CR-7007 because they may be interpreted as review guidance, which is not the staff’s intent (NEI 30)
- Removed references to 10 CFR 50.69 and GL 85-06 to avoid potential confusion with different safety significance categorization schemes
- Added a sentence on manual control connections (ACRS Member Comment 5a)
- Added a clarification that displays and manual controls credited as the diverse means for Point 3 may also be credited for Point 4 (NEI 32)
- Added a footnote regarding the IEEE Std 279 and IEEE Std 603 requirements for certain manual controls

Changes to Section B.3.4

- Clarified the language to address concerns associated with references to SRP Chapter 19 (NEI 4, 22)
- Included a discussion of the base PRA model (NEI 6)
 - Added reference to previously approved risk-informed applications
- Clarified the language to address concerns regarding the need to consider intersystem CCFs of DI&C
 - Removed terminology not typically used in PRA (NEI 19)
 - Clarified modeling the impact on multiple systems (NEI 5)

Changes to Section B.3.4

- Clarified acceptance criteria for risk involving operator actions (NEI 8)
- Provided specific acceptance criteria for determining the appropriate means to address the CCF instead of referencing the criteria in Section B.3.1.3 (discussions during ACRS DI&C SC briefing)

Changes to Section B.4

- Various edits made to improve the clarity of the Point 4 discussion and ensure consistency with SRM-SECY-22-0076 (NEI 9, 34, and 35)
- Removed reference to RG 1.62 as it is not intended to address Point 4 (NEI 20)
- Removed paragraph on long-term management of critical safety functions because it did not contain related acceptance criteria (NEI 21)
- Replaced “risk-informed critical safety functions” with “critical safety functions (which may have been determined using risk information)” (discussions during ACRS DI&C SC briefing)

Key Messages

- BTP 7-19 revised to incorporate SRM-SECY-22-0076
- Changes made after September 2023 ACRS Full Committee briefing in response to public comments and ACRS member feedback
 - Clarifications made throughout the BTP
 - No substantive changes made to analysis methodologies or acceptance criteria

Next Steps

- ACRS Full Committee briefing scheduled for March 6, 2024
- The staff is planning to issue the final BTP 7-19, Rev. 9 in May 2024

Closing Remarks

Acronyms

ACRS	Advisory Committee on Reactor Safeguards
BTP	Branch Technical Position
CCF	Common Cause Failure
D3	Defense-in-Depth and Diversity
DI&C	Digital Instrumentation and Control
I&C	Instrumentation and Control
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
PRA	Probabilistic Risk Assessment
RG	Regulatory Guide
SECY	Commission Paper
SRM	Staff Requirements Memorandum
SRP	Standard Review Plan

References

- Transcript of September 7, 2023, ACRS Full Committee briefing and attachment with comments provided by Member Charles Brown and Member Thomas Roberts (ML23264A865)
- NEI Comments on Draft BTP 7-19, Revision 9, dated November 21, 2023 (ML23326A117)