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UNITED STATES NUCLEAR REGULATORY COMMISSION

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RISK-INFORMED UPDATES TO SELECTED

SRP CHAPTER 2 SECTIONS

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PUBLIC MEETING

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MONDAY

OCTOBER 22, 2018

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The Public Meeting convened in the TWFN Auditorium, 11545 Rockville Pike, Rockville, Maryland, at 9:00 a.m, Daniel Mussatti, facilitating.

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NRC STAFF PRESENT

DANIEL MUSSATTI, Facilitator

FREDERICK BROWN, Director, Office of New
Reactors

ANDREW C. CAMPBELL, Division of Licensing,
Siting and Environmental Analysis, Office
of New Reactors

MICHAEL LEE, Division of Licensing, Siting and
Environmental Analysis, Office of New
Reactors

MICHAEL D. MAZAIKA, Division of Licensing,
Siting and Environmental Analysis, Office
of New Reactors

JENISE-MARIE THOMPSON, Division of Licensing,
Siting and Environmental Analysis, Office
of New Reactors

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

2 9:04 a.m.

3 MR. MUSSATTI: Okay. This is a small
4 crowd. So I don't need quite as many notes as I
5 thought I did.

6 I'm Dan Mussatti. I'm with the NRC's
7 Facilitator Corps. I'm going to be trying to help
8 you today to make sure that this meeting is timely.
9 And that the information goes back and forth in an
10 easy manner.

11 We're going to take a break somewhere
12 around ten o'clock for a few minutes. It's a short
13 break. So, if you're going to go up to the -- try
14 and get a cup of coffee or something like that, please
15 try to come back on time as fast as you can.

16 And we're going to try to start on time
17 so that we can get through all of this. The prob --
18 what we're trying to do is have the meeting broken
19 into two pieces.

20 The first part is going to be the
21 presentations from the NRC Staff. And after that,
22 we're going to have an opportunity for the public and
23 all the people that are sitting here in the room to
24 ask questions.

25 We did not plan on having these questions

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1 and comments responded to by the staff at the time.
2 If it's a short little yes or no kind of an answer,
3 then yeah, we'll probably do that.

4 But, we're in an information gathering
5 mode today. So, we're probably going to be
6 responding through what our reactions to your
7 comments on the actual changes to the -- to the reg,
8 or to the NUREG.

9 We have a court reporter in the back of
10 the room who's going to transcribe this today for us.
11 So, when you do speak, I'd ask you to line up behind
12 the microphones.

13 And when I call on you to speak, start
14 with your name and your affiliation. And then speak
15 clearly and slowly so that we get a real good
16 transcription here.

17 Also, what you say may not be what you
18 thought you were trying to say. Or what we hear may
19 not be what you're trying to tell us.

20 So, it's a good idea for you to follow up
21 any comments that you have in -- that are verbal here,
22 with something in writing. So that we make sure that
23 we've got as accurate assessment of what it is that
24 you're to say as possible.

25 There's an email website that is

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1 available to you that's in the paperwork that's been
2 handed out. And it will be in one of the, I think,
3 in one of the final slides will have that in it as
4 well.

5 Feel free to send us your comments,
6 additional comments, and a transcription of whatever
7 it is you were trying to say here, if at all possible.

8 Other than that, I don't think I need to
9 go into a whole bunch of rules about, you know, one
10 at a time and all that. You've been through all of
11 this stuff before. And we know how to have decorum
12 in our forum.

13 So, what I'd like to do now is I would
14 like to introduce Fred Brown, who is the Office
15 Director here. And let him take over. The switch
16 is on the bottom.

17 MR. BROWN: Well, thank you. And good
18 morning to those in the room, largely staff. And
19 hopefully on the line. And hopefully we will be
20 Skyping here before too long.

21 Thank you for coming. This is actually
22 a pretty important topic. The Standard Review Plan
23 is really at the heart of what we do as an agency in
24 licensing.

25 It's important to our applicants because

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1 it lays out the expectation for a submittal.
2 Particularly, or specifically in this case, for an
3 operating reactor.

4 And so the amount of work, the analysis,
5 the documentation that's specified in the SRP, can
6 drive actions on the part of an applicant.

7 It's important to the Staff because it's
8 what we use to ensure that we've thought of the things
9 that we need to think about. And that we're making
10 the findings we need to make.

11 And it's -- the Standard Review Plan is
12 also important for adjudicatory and legal purposes.
13 To define the structure of the analysis that the Staff
14 has planned and has taken in order to perform a
15 review.

16 The Standard Review Plan goes back quite
17 a ways into NRC history. And if you look at the
18 document over the years, you will notice that it has
19 grown significantly.

20 While the regulations themselves haven't
21 changed that much, there's been a tremendous amount
22 of operating experience. And that operating
23 experience is primarily associated with the large
24 light water reactors that we've licensed over the
25 years and we've now got 40 or more years of operating

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1 experience with.

2 And so the Standard Review Plan, which
3 started out identifying what the regulatory
4 requirements were, and then the findings against
5 those requirements, has served as a knowledge
6 management tool for the technical Staff to remember
7 and to think about things that have happened with the
8 operating fleet.

9 Now, as we find ourselves no longer
10 generally reviewing large light water reactors with
11 active safety system, rather what we're reviewing
12 more of now, are passive safety features and small
13 modular reactors or System 3 -- Generation 3 pluses,
14 it's been referred -- they've been referred to.

15 And as we start to think about non-light
16 water reactor reviews, we have the opportunity to go
17 back and revise the Standard Review Plan to get back
18 to the basic fundamental question of what is it that
19 an applicant has to demonstrate?

20 What does the Staff have to have findings
21 on? And how can we focus both the application itself
22 and our review on the things that are most applicable
23 and most safety significant for the new designs that
24 we're being asked to review.

25 And so it's kind of interesting, the

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1 leadership of the agency has been thinking along the
2 lines of the importance of revising the Standard
3 Review Plan. And organically within the
4 organization, some of the Staff and branches have
5 been doing the same things.

6 So, what we're going to talk about today
7 are some sections of the Standard Review Plan where
8 we've had a convergence of interest and thought. And
9 that convergence is timely, and it's leading to what
10 we're calling a pilot.

11 But, it also is a little less than perfect
12 in the presentation. So, there is a regular ongoing
13 SRP update process.

14 And this year the folks that will be
15 talking this morning about the chapters that we're
16 going to talk about, were scheduled to revise their
17 sections.

18 And had started to approach those
19 revisions from a how do we focus this on the level of
20 effort ought to be commensurate with the safety
21 significance.

22 The unfortunate -- and I mean, that's
23 obviously good. And it's consistent with a broader
24 look at the Standard Review Plan to achieve that same
25 outcome.

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1 The slightly unfortunate thing is that in
2 an ideal world we would have started with an entire
3 chapter or a subchapter 2.4, rather than 2.4-3 for
4 instance. And so the Staff will -- today will talk
5 about how what we published in the Federal Register
6 Notice should be read in the context of a slightly
7 broader change.

8 But if you take the time to listen to
9 that and understand, I think that what's going to be
10 described is a very positive approach to having
11 applicants focus on what's most important for their
12 site. And for the Staff to focus its efforts on
13 what's most important for those sites.

14 In addition, the structure, the format
15 and structure that we publish really is more
16 consistent with what we've historically done in the
17 SRP. And so that's -- that's the other area that
18 we're really interested in public comment.

19 Both in this meeting and then in written
20 comments for our Federal Register Notice solicitation
21 for input on structurally, how can we redo the
22 Standard Review Plan in a way that it both focuses
23 the effort of the applicant. And focuses the effort
24 of the Staff on the findings required for the
25 Regulation.

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1 So I think conceptually what you're going
2 to hear today is a really good first effort to focus
3 the Standard Review Plan content. And an openness
4 to engage on how we can go beyond just structuring
5 the content too actually structuring the process and
6 the document, the SRP itself.

7 So we look forward to active engagement
8 and participation. Hopefully we'll have Skype up
9 here.

10 But, I would now like to turn the mic
11 over to Dr. Andy Campbell. Who will get into more
12 of the details.

13 MR. CAMPBELL: Thank you Fred. So, I'm
14 Andy Campbell. I'm the Deputy Director of the
15 Division of Licensing, Siting, and Environmental
16 Analysis here at the NRC.

17 And my area of responsibility includes
18 all external hazards. We have an external hazards
19 center of expertise. And within that flooding,
20 seismic, other sorts of external hazards are covered,
21 both natural as well as man made.

22 So the review scope -- so today's
23 meeting, the review scope for the proposed changes of
24 four Standard Review Plan sections. So, we're going
25 to cover those four.

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1 The scope of the proposed changes
2 summarized in the Federal Register Notice includes
3 hydrology and meteorology, which was Federal Register
4 49132, or 83 49132, surface affirmation 83 FR 41939.

5 So Chapter 2.4 was selected as a test
6 case for risk informed performance-based revisions.
7 To focus our efforts on what we're going to be calling
8 consequential events, and consequential floods.

9 So, recent application of NUREG-0800,
10 which is the Standard Review Plan, as you heard,
11 includes early site permit and combined operating
12 license reviews. We've completed to date, with
13 complete licensing, we did reviews at other sites.
14 But, some withdrew and some are still suspended.

15 But five early site permits have been
16 issued. And eight combined operating licenses have
17 been issued. So, that's a significant database of
18 work in these areas.

19 We've also, since 2012 been reviewing 50
20 -- what's called a 50.54(f) letter response, an
21 information request following the Fukushima Daiichi
22 nuclear power plant accident where both an
23 earthquake, but more importantly a tsunami caused a
24 total station blackout. And resulted in meltdowns
25 of three reactors.

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1 So, that review encompassed both seismic
2 and flooding reevaluations of about 60 reactor sites.
3 So there's this large database of work in the external
4 hazards area in terms of impacts.

5 Staff identified opportunities for
6 improving the efficiency and effectiveness of NRC's
7 regulatory review process. There are lessons learned
8 from this extensive set of licensing actions and
9 reviews.

10 There's large indication from that of
11 where we can do a more risk informed performance-
12 based approach in terms of the principals. And
13 there's really a more focused set of review criteria
14 when you're doing a flooding and/or seismic analysis.
15 And today 2.4 is talking about flooding.

16 So, the purpose of this meeting is to
17 begin a dialog with stakeholders. We're in listening
18 mode.

19 We want to get your comments on the
20 general approach to the Standard Review Plan updates,
21 which Fred talked about, and you'll be hearing about
22 as we go through the presentations. We want your
23 feedback on proposed risk informed performance-based
24 revisions to Chapter 2.4.

25 And we also want recommendations on how

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1 risk informed performance-based approaches can be
2 expanded to other SRP chapters and sections. And
3 we're seeking recommendations on modifications to the
4 Standard Review Plan format itself.

5 We will also be discussing potential
6 future SRP updates to Sections 2.3, 2.4, and 2.5 in
7 the coming calendar years of 2019 and 2020.

8 So the staff that -- on the update team,
9 I'll just -- you can see the slide. Or if you can't,
10 it's Hosung Ahn -- Dr. Hosung Ahn, Dr. Stephanie
11 Devlin-Gill, Joe Giacinto, Dr. Mike Lee, Dr. Nebiyu
12 Tiruneh, Brad Harvey, Mike Mazaika, Laurel Bauer on
13 geology, Gary Stirewalt -- Dr. Gary Stirewalt, Jenise
14 Thompson on geology, and project management is
15 Hoellman, Notich, and Rankin.

16 And with that I'm going to get -- start
17 with hydrology, Chapter 2.4 updates. These are the
18 tsunami hazards and channel migration. That's going
19 to be Dr. Mike Lee.

20 Surface deformation updates, which is SRP
21 Section 2.5.3 is Jenise Thompson. And onsite
22 meteorological monitoring program update is Section
23 2.3.3. And that's going to be Mike Mazaika.

24 And with that, I'm going to turn it back
25 to Dan. And let Dr. Lee begin his presentation.

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1 MR. MUSSATTI: Okay. Before we start
2 the presentation, I've got a little housekeeping work
3 here that needs to be done.

4 We have found out that we have some
5 technical difficulties in trying to get the webinar
6 to connect. And we know that there are some people
7 that are online listening on the phones that have
8 been trying to figure out what's going on.

9 We don't think we're going to be able to
10 get the webinar to actually fire off. But, if you're
11 listening on the phone and you can follow along with
12 the slides, you're more than welcome to do that.

13 And we will see what we can do about
14 trying to take your questions later on if you have
15 them. To get the slides, if you would go to the
16 NRC.gov home page, there's a calendar right there on
17 the front page, right in the middle that has today
18 highlighted.

19 If you click on that, it will give you
20 this webinar and this morning's meeting as a meeting
21 for the day. And towards the bottom of that you will
22 be able to see the Adams number for the slides.

23 If you want the Adams number for the
24 slides right now, grab a pencil. And I can give you
25 that number so you don't have to go to the web -- to

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1 our web page to get it.

2 The ascension number under Adams is
3 ML18292A592. One more time I'll say that number for
4 you. It's ML18292A592.

5 And we'll try to work on this, like I
6 said, to be able to get your questions today. If
7 not, please mail in your questions or your comments
8 to the information that's -- the address that's on
9 that announcement.

10 And we will include that in our work in
11 the future. Thank you.

12 MR. CAMPBELL: So, I'm going to introduce
13 Dr. Mike Lee, who's going to talk about the 2.4
14 section tsunami hazards and channel migration. Dr.
15 Lee.

16 MR. LEE: Thank you Andy. For those that
17 are participating remotely, I'm going to turn to slide
18 one.

19 And what I -- we've done here is just
20 kind of show graphically or in cartoon form the points
21 that Andy's pointed out or acknowledged earlier, that
22 the SRP update process kind of benefitted from some
23 lessons learned. First with the ESP and COLA reviews
24 that were done over the last decade or so and more
25 recently.

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1 We've been working with our licensees in
2 the context of the 50.54(f) review to examine the --
3 to reexamine the design basis for flood hazard reeval
4 -- floods and seismic events.

5 So, if we can turn to slide two. And
6 parochially now we'll just turn directly to flooding.

7 In the context of the flood hazard
8 reevaluations and based on what the Standard Review
9 Plan tells us to do in Chapter 2.4, we more or less
10 looked at eight flood causing mechanisms. Which are
11 laid out here for you.

12 And for the benefit of the folks on the
13 phone, I'll just read them briefly. We have local
14 intense precipitation. Which is basically a rainfall
15 event that occurs over the footprint of the power
16 plant.

17 We have flooding on streams and rivers,
18 which maybe adjacent to a particular power plant site.
19 We're concerned of course with dam failures and onsite
20 water control structures.

21 You may have a breach of a dam upstream
22 that leads to kind of a transient flood event that
23 migrates downstream. Or you could have a flood --
24 you could have a dam breach if you will, for a cooling
25 system, a water storage system that's onsite.

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1 Storm surge applies to those sites which
2 are located predominantly in marine settings along
3 the coast. Seesh (phonetic) is a -- more or less an
4 atmospherical phenomena that occurs when a -- when
5 you have resident vibration of the water surface on
6 very large bodies of water like the Great Lakes.

7 Tsunami of course is an event that we're
8 all very interested in. That occurs again, in
9 reference to a marine setting.

10 You may have ice induced flooding due to
11 some ice jam upstream or an ice dam downstream of a
12 nuclear power plant that's adjacent to a river.
13 Creating backwater event -- effects and the potential
14 for flooding.

15 And lastly, we're always interested in
16 channel migrations or diversions. Particularly in
17 reactor sites that are in what you might consider to
18 be a dynamic environment in terms of riverine
19 processes.

20 So if we could turn to slide three.
21 Okay. So, having done these evaluations
22 collectively, we began to see a few things.

23 We found for example that not all sites
24 were subject to the same -- to all flood causing
25 mechanisms.

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1 And in particular we found that only a
2 few flood causing mechanisms were actually found to
3 be consequential in terms of defining the design basis
4 or challenging if you will, a design basis in terms
5 of water surface elevations.

6 So, we found for example that LIP and
7 associated drainage were practically at all power
8 plant sites. Flooding from streams and rivers,
9 hypothetical failure of dams and other onsite water
10 structures were also challenging some design
11 assumptions, as well as storm surge.

12 So, turning to slide four. We also found
13 that most flood causing mechanisms were not discrete
14 events.

15 They usually occur in combination with
16 other site -- some other type of flood causing
17 mechanism.

18 For example, you may have a heavy
19 precipitation event that occurs over a large
20 watershed, and that may have an impact both on the
21 water surface elevation in some contiguous river or
22 stream. But it also may begin to challenge a water
23 storage structure such as a dam upstream from a site.

24 And that being said, we also found that
25 associated effects were important. You know, water

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1 surface elevation increases lead to other
2 consequences like collection of sediment,
3 hydrodynamic or hydrostatic loads can change, things
4 like that are important for evaluation in the context
5 of a reactor design.

6 We also learned that some flood causing
7 mechanisms, I mean, it's not really a surprise, but
8 are controlled by topography, geography, and/or
9 climatic setting.

10 Not all sites are subject to the same
11 flood causing mechanisms. A site out in the desert
12 may not have trouble with a tsunami or ice dams or
13 ice jams as opposed to inland sites, which typically
14 aren't affected by storm surge or tsunamis.

15 So, we found basically that the hazard
16 you might argue can be discretely defined in terms of
17 a marine or coastal setting. Or a different suite
18 of hazards for continental and inland locations.

19 And lastly, one of the other insights on
20 slide six is that not all flood causing mechanisms
21 are equal in terms of occurrence and consequence.

22 The magnitude of the event can change
23 depending on the type of flood causing mechanism, the
24 intensity, the duration, and the location. All of
25 these things we found were important in reviewing

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1 design basis at the operating -- within the operating
2 fleet.

3 So, having reflected on what we've
4 learned from both the ESP and the COLA reviews, as
5 well as the 50.54(f) reviews, we can reach some
6 general conclusions. And those are -- I began to
7 address in slide six.

8 Not all flood causing mechanisms are
9 equal in time and space. A rainfall event, for
10 example, that you might associate with a tropical
11 storm, is going to be a lot different from the
12 rainfall event that you might associate with the
13 synoptic storm that originates on the continent.

14 So you have a situation where the
15 locations around the power block may be different in
16 terms of flood events. The magnitude, intensity of
17 duration is also not usually uniform across the power
18 block. And the associated effects that I discussed
19 earlier can also vary.

20 And so what we find though, is we began
21 to see that we could distinguish between what you
22 might consider to be a consequential flood in terms
23 of defining the design basis, or challenging the
24 design basis, versus a flood that was
25 inconsequential, that had not material affect on the

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1 design basis.

2 And more -- in our view the
3 inconsequential floods do not contribute to defining
4 the design basis. They're just not important if they
5 don't provide us with any design challenges.

6 So, turning to slide seven, and thinking
7 about what we might do in context of revising or
8 updating the Standard Review Plan, particularly for
9 Chapter 2.4, this leaves the Staff's judgement at
10 this time that the definition of a consequential flood
11 should be the focus of the review.

12 It always has been if you think about it.
13 We're always interested in what the design basis flood
14 elevation is for a particular flood causing
15 mechanism.

16 So, what we're proposing now is in terms
17 of revisions to Chapter 2.4. That we rely on a
18 hierarchical or graded screening approach to
19 identifying consequential flood causing mechanisms.

20 And for those flood causing mechanisms
21 that are found to be consequential to defining the
22 design basis, we believe that the Staff should focus
23 its review on inundation maps that identify the
24 location, magnitude, intensity, and duration of
25 flooding.

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1 These are the things that were key in our
2 50.54(f) and ESP and COLA reviews. And that you also
3 -- the Staff would also be examining the description
4 of associated flooding effects in the context of any
5 consequential flood causing mechanism.

6 So, if we can turn to slide eight, please.
7 So, for the flood causing mechanisms found to be
8 inconsequential, this is one of the key revisions
9 we're proposing to how we address these issues in the
10 context of the Standard Review Plan, that the safety
11 evaluation report in whatever section in 2.4, would
12 be limited to a single statement that the flood
13 causing mechanism in question was found not to be
14 applicable at the site.

15 And there would be some technical
16 justification. But we don't think we needed an
17 encyclopedic evaluation anymore, if I can use that
18 term.

19 That the slightly longer technical
20 explanation for why a flood causing mechanism might
21 be inconsequential, would be in Chapter 2.4.1. Which
22 is the hydrologic summary chapter that appears at the
23 front end of Chapter 2.4.

24 And then the Staff would look to that
25 summary description, supported by some technical

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1 rationale, possibly even including an analysis of a
2 limited extent to say why this particular flood
3 causing mechanism wasn't applicable to the site.

4 For example, you may have a slight that's
5 a -- you may have site, excuse me, that's in a
6 Mediterranean type of climate, and you wouldn't
7 expect ice to be an issue.

8 So, we can, you know, accept those types
9 of arguments, I think, with some reasonable degree of
10 success to differentiate between types of floods that
11 are consequential versus inconsequential.

12 But, turning parochially now to what we
13 made available for public comment, we upon reflection
14 and we see that we still need to add a little more
15 fine tuning to our writing.

16 And what the Staff's intent is in terms
17 of what we're looking for or proposing for applicants
18 to consider in the future, we would say, I think I'm
19 on the third tick. Oh, yeah. There you go. Thank
20 you.

21 On slide eight. That this section, for
22 example, if you're in an inland site, let's say in
23 the Midwest somewhere, we would expect for purposes
24 of the tsunami discussion, we'd say this section we're
25 proposing is only applicable to a site where tsunami

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1 flood causing mechanisms are found to be
2 consequential.

3 So, we're trying to, you know, improve
4 our thinking. And communicate that in terms of
5 writing as we seek public comments.

6 So turning to slide nine, please. So,
7 what we're -- what you saw in the Federal Register
8 Notice that appeared this past September, was a
9 glossary of terms that include the description of
10 LIT.

11 And so when we get into our review of
12 2.4.1, we're proposing ultimately to include this
13 glossary of terms as an appendix to Section 2.4.1 of
14 the SRP.

15 For 2.4.6, some of the description --
16 some of the revisions we made including introducing
17 this new terminology, which was identified in a series
18 of footnotes, we streamlined the reference list.

19 We don't think we need to be in a position
20 to tell applicants nor the Staff what references are
21 pertinent to the evaluation of tsunami hazards. We
22 think this is something that the Staff should be very
23 aware of in context of doing their reviews.

24 And at the same time, the literature is
25 always changing. So, we don't want to find ourselves

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1 in a position of having to update the reference list
2 periodically based on changes in the literature.

3 And the same can be said for channel
4 migrations and stream diversions. The changes we
5 propose were similar in terms of cleaning up the
6 writing, or refining the writing, and adding a new
7 terminology via footnotes.

8 We also found for the purposes of the
9 50.54(f) reviews and the ESP and COLA reviews that
10 reliance on imagery from satellite platforms is very
11 useful to rely on. So, we've introduced that type
12 of review feature into the SRP.

13 Okay, so turning to slide ten, please.
14 In terms of the longer vision for what we're thinking
15 about or proposing that we do in terms of revisions
16 to Section 2. or Chapter 2.4 of the SRP, we're
17 proposing that we're going to do some extensive
18 rewrite of Section 2.4.1, the hydrologic description
19 to differentiate between consequential and
20 inconsequential flood causing mechanisms.

21 We're proposing that the Staff place its
22 emphasis review, emphasis that is on the evaluation
23 of consequential flood causing mechanisms, because
24 these are the most -- flood causing mechanisms most
25 important to defining design basis.

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1 We're proposing too simply the discussion
2 in some respects, and to eliminate references to the
3 discussion of water use by -- outside of the reactor
4 area.

5 These are issues that are typically
6 handled in the environmental assessment, or EIS
7 phase. We don't think we have to re-review that
8 information in the license application.

9 We're also going to introduce a glossary.
10 Which is the list of new terms that we propose that
11 appear in the FRN.

12 For floods, for 2.4.2, we're proposing
13 that we repropose that SRP to focus on local intense
14 precipitation. As I mentioned earlier, just about
15 every site that we looked at for the purposes of the
16 50.54(f) reviews had issues relative to local intense
17 precipitation.

18 So, we believe it's important now that we
19 update the SRP to address that particular flood
20 causing mechanism. In introducing the LIT concept,
21 if I can use that term, we're going to also address
22 how we evaluate the probable maximum precipitation
23 estimate that's important in making that -- in
24 performing that review.

25 And then we're also going to propose some

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1 methodologies for how you might evaluate LIT.
2 Lastly, we're also proposing -- again, and this is in
3 terms of the broader vision.

4 We're proposing that we combine SRP
5 Chapters 2, 4, 12 related to groundwater behavior and
6 2, 4, 13 in terms of the accidental release of
7 radionuclide affluence into one SRP chapter.

8 We think it might improve the efficiency
9 of the Staff review. And reduce some redundancy in
10 the SRP if we combine those.

11 So, as Andy mentioned before, as we make
12 new SR -- as we work through the SRP review process
13 and get new SRP sections available, those will be
14 noticed in the Federal Register.

15 The Staff is always open to meeting with
16 the public on any issue, you know, relative to these
17 updates. We particularly believe that we're going
18 to have public meetings later on down the road
19 relative to the Section 2.4.1 on the hydrologic
20 description, LIT, and groundwater.

21 So, I thank you for your time.

22 MR. CAMPBELL: Thank you Dr. Lee. Thank
23 you Mike. So, next I'm going to introduce Jenise-
24 Marie Thompson, who is a geologist in the Division.

25 And Jenise is going to talk about service

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1 deformation, SRP Section 2.5.3. Jenise?

2 MS. THOMPSON: Good morning. Hi, I'm
3 Jenise Thompson. And I'm a geologist in the Office
4 of New Reactors. And I was the lead for the updates
5 to SRP Section 2.5.3, surface deformation.

6 For this update to the SRP we looked at
7 three key insights and lessons learned. The first
8 was our most recent SRP update which was done in 2014.

9 And the focus in 2014 we added
10 information related to the using the site safety
11 audits and REI development. We added information
12 related to the geologic mapping, license or permit
13 condition.

14 And as always with these SRP updates, we
15 look at lessons learned from recent reviews. Another
16 thing that we looked at for this particular update
17 were insights from the 05.504(f) reviews. Can you
18 go back, please?

19 So, we looked at the risk informed
20 approach that was used successfully for flooding. It
21 allowed licensees to focus on the hazards that are
22 most likely to impact the site and adversely affect
23 the SSEs important to safety.

24 And kind of thought of how we could apply
25 that to our review in surface deformation. And then

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1 we also looked towards our ESP and COL review
2 experience, where we noted that there's a variable
3 potential for surface deformation based on numerous
4 site specific factors.

5 So, considering that each site is unique
6 based on their unique geology and their geologic
7 setting, we think that the risk informed approach
8 that was used by flooding in the 50.54(f) reviews
9 maybe applicable to the review of the potential for
10 surface deformation at a site.

11 Next slide, please. So, looking also to
12 our regulatory statutes, our siting criteria are in
13 10 CFR, Part 100.23. And we were tasked with
14 evaluating the potential for tectonic and non-
15 tectonic surface deformation.

16 And something else that informs our
17 reviews is the geology of North America. It's
18 relatively diverse geologically.

19 The tectonic and structural history is
20 not uniform. It's varied depending on where you are.
21 And therefore the potential for surface deformation
22 is going to vary spatially as well.

23 So, factors such as subsurface lithology,
24 the local and regional geologic structures,
25 anthropogenic activities, are all factors to consider

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1 when assessing the potential for surface deformation
2 at a site.

3 So, next slide, please. So, using all
4 of this information, we're on slide three of SRP
5 Section 2.5.3, surface deformation.

6 So, using all of this information, our
7 update to SRP Section 2.5.3 is that the investigations
8 for a potential for surface or non-tectonic surface
9 deformation still need to be conducted for each
10 individual site.

11 But these investigations should be
12 commensurate with the geologic assessment of evidence
13 for potential for surface deformation.

14 So, looking at the level of detail or
15 documentation or burden, it should be consistent with
16 that geologic assessment of evidence as to whether
17 there is a potential for surface deformation, either
18 tectonic or non.

19 And whether that surface deformation is
20 likely to impact the site and affect structures,
21 systems, or components that are important to safety.

22 So what this means, to give you an
23 example, in a hypothetical site that's underlain by
24 granite, perhaps there is a quaternary or recent 2.6
25 million years fault near the site. Let's say five

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1 miles.

2 You could reasonably expect to say that
3 the level of detail that you would need to provide
4 for surface deformation due to karst, would be much
5 less than the level of detail you would need to
6 provide for tectonic surface deformation associated
7 with that recent fault.

8 So your surface deformation, your level
9 of detail is going to vary depending on what the
10 mechanism is.

11 So, we also our final, you know, I guess
12 major change or update to this was looking at the
13 potential for non-tectonic surface deformation due to
14 anthropogenic or human activities.

15 So, mining, underground fluid injection.
16 As we continue to alter the subsurface, we learn more
17 about how those activities may affect not only the
18 subsurface but the surface, and deformation of that
19 surface.

20 So that's something that we've learned
21 that we should be including within the scope of
22 surface deformation in SRP Section 2.5.3.

23 Next slide, please. So to summarize, we
24 saw how effective the use of a risk informed approach
25 was for flooding. And we identified a way that we

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1 could apply it to assessing the potential for surface
2 deformation that could adversely SSEs important to
3 safety.

4 And we added non-tectonic surface
5 deformation due to anthropogenic activities or
6 effects at the site.

7 So, looking ahead, this is -- SRP Section
8 2.5.3 is one of five Sections in 2.5. So, looking
9 ahead we hope to use insights from this update of
10 2.5.3 to inform future updates of 2.5.1, which is
11 geologic characterization information, 2.5.2, which
12 is vibratory ground motion, 2.5.4, the stability of
13 subsurface materials and foundations, and 2.5.5, the
14 stability of slopes.

15 And all of that is relatively far off in
16 the distance for us. So, we're looking at 2020 before
17 we undertake any future updates in 2.5.

18 MR. CAMPBELL: So, with that thank you
19 Jenise. Next I'd like to introduce Mike Mazaika.
20 He's a meteorologist in the Division.

21 And Mike is going to talk about onsite
22 meteorological monitoring program. Which is SRP
23 Section 2.3.3.

24 This is a section really focused on
25 technology and monitoring. And so with that what we

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1 wanted to do was include this in the update.

2 It is more about incorporating lessons
3 learned from as the technology increases. And also
4 some of our experience with monitoring programs
5 increases.

6 So with that Mike, could you go ahead?

7 Thank you.

8 MR. MAZAIKA: Thank you Andy. Good
9 morning folks. For you horse racing fans, we're at
10 the top of the back stretch now.

11 For you ice hockey fans, I'm the caboose
12 among the SRP sections that's -- that we've discussed
13 today. Caboose because I'm an old hockey goalie.
14 And it's a hockey thing.

15 For the rest of you, we're almost done.
16 There are only four slides in my presentation.

17 The first one is a brief look back. The
18 second one discusses some lessons that we've learned
19 from our reviews.

20 The third is a look forward of sorts.
21 Anticipating the kinds of issues that we might have
22 to review in the future for siting small modular
23 reactors.

24 And the fourth and final slide in this
25 set is also a look ahead. But at other sections

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1 under SRP Section 2.3 and that we're slated to update.
2 If I could just have the next slide, please.

3 Standard Review Plan Section 2.3.3. deals
4 with our review of the onsite meteorological
5 measurement's program. That's set up and run by an
6 applicant before a new facility or a new unit gets
7 built. Or by a licensee once the facility is
8 operating.

9 In and of itself, meteorological or MET
10 monitoring is not a risk informed activity. And was
11 not covered by the 50.54(f) letters that were
12 discussed earlier for hydrology and geology.

13 However, MET monitoring programs may
14 provide supporting data for risk informed activities.
15 For example, dispersion modeling analysis and severe
16 accident analysis.

17 Listed here are some examples on this
18 slide of some of the things that were necessary to be
19 updated in this proposed revision. Hopefully the
20 folks that are online have access to the slides now.

21 I didn't plan to read them for you. But,
22 to summarize, the first item is aimed at making the
23 Staff review guidance more consistent with the
24 guidance that we give to applicants to set up and run
25 their MET monitoring program. And that's discussed

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1 in Reg Guide 1.23, Onsite meteorological Monitoring
2 Programs.

3 The third item recognizes that other
4 agencies are involved with meteorological monitoring.
5 For example, the EPA, industry organizations like the
6 American Nuclear Society.

7 That for efficiency we don't have to
8 reinvent the wheel, but we can reference those
9 documents. But that those documents get updated over
10 time as well.

11 The last two items on slide two, they're
12 intended to identify some of the linkages that we
13 have with other regulatory guides and where
14 monitoring procedures are called for. They include
15 Reg Guide 1.21, 1.33 for example, that deal with
16 quality assurance requirements and the monitoring
17 that occurs once a facility is operating.

18 Can I have the next slide, please? This
19 would be slide three. That's not me falling over.
20 That's my cane.

21 This next slide shows some lessons
22 learned that the Staff has from our reviews of the
23 combined license in early site permit applications
24 over the last ten years or so. Standard Review Plan
25 under Section 2.3 was last updated about ten years

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1 ago.

2 It's also important to understand that
3 these proposed revisions also have their roots in two
4 other places. I came from the consulting industry,
5 and as a user, a reader of Regulatory Guide 1.23 and
6 other related guidance, and being aware of what the
7 NRC Staff looks for in performing its reviews, this
8 allows us to include perspectives from the regulated
9 community.

10 But that's not the end of it. And that's
11 why you are here today online or in person. Why we
12 make these proposed updates available for public
13 comment. Your comments add value to these documents
14 as well.

15 Again, I won't read what's on the slide.
16 But they're representative of some of the things that
17 we've seen along the way. And that we considered
18 important enough to address in this update.

19 The first item, there's nothing like
20 boots on the ground early in the review process to
21 understand how a monitoring program is sited, how
22 it's set up, how it's operated and maintained, how
23 it's documented. This is a preventative exercise if
24 you will. It's a training opportunity as well for
25 younger staff and for older staff alike.

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1 The second and third items represent some
2 additional clarifications to those topics that we
3 considered important enough to be included. The
4 second related to new facilities proposed to be
5 located at existing plant sites.

6 The third related to how measured data
7 will be used. We don't measure just data just for
8 the sake of measuring data. It has an application.
9 And we have to be aware of how those data, how those
10 numbers get used.

11 The fourth item was added to reflect
12 changes. In this case, wind measurements. But it
13 also applies to other MET data.

14 And being cognizant of how those data
15 should be processed based on how they're going to be
16 used. And that's a benefit that we had from
17 considering other agency and other industry guidance.
18 Next slide, please.

19 This next slide is intended to highlight
20 some of our thinking ahead to the siting of the next
21 generation of reactor technology. For example, small
22 modular reactors. Which might, because of their
23 smaller output, because they're smaller in size, they
24 might be deployed in non-traditional or remote
25 locations that are subject to harsh environment

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1 conditions.

2 We've done some pretty good, I think
3 initial noodling about the potential issues that
4 applicants might encounter. And that we're going to
5 have to deal with as reviewers.

6 There are also some ideas that applicants
7 might need to take into account when they're planning
8 and operating their MET monitoring program at such
9 locations. And because the Standard Review Plan is
10 primarily guidance to the NRC staff that we need to
11 have a leg up on before the fact.

12 For those of you that are familiar with
13 or involved with meteorological monitoring programs,
14 hopefully the potential issues listed on this slide
15 will strike a cord and get you all thinking as well.
16 These will also be reflected in planned updates for
17 other SRP sections.

18 And the next and final slide. That leads
19 to another look ahead. Standard Review Plan sections
20 that we're planning to update in calendar year 2019.

21 Of the five sections under Section 2.3,
22 we aim to update SRP Section 2.3.1. There are about
23 20 climate related items that are considered under
24 this section.

25 Unlike SRP Section 2.3, the bulleted

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1 items listed here have a more direct linkage to risk
2 informed considerations. But they're
3 characteristics of a particular location. And their
4 implication to the design and operation of a facility
5 are taken into account by the engineering teams.

6 Under Section 2.3, our review is more
7 limited to evaluating whether or not these conditions
8 can be reasonably expected to occur at a proposed
9 location.

10 The update to this section will consider
11 whether all of the climate related items and the
12 current revision are necessary to be included going
13 forward.

14 And finally, the planned revision to SRP
15 Section 2.2. Which deals with local meteorologicals
16 more closely related to SRP Section 2.3.3, in that it
17 presents comparisons of the data that you acquire
18 from the onsite MET monitoring program.

19 Which will be obtained over a relatively
20 shorter period on the order of two years. And we
21 want to evaluate the representativeness of that data
22 against long term conditions by comparison to nearby
23 offsite measurements.

24 So, with that I'll be quiet now. I don't
25 see many heads bobbing. I appreciate your attention.

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1 And I'll turn the podium back to Andy.

2 MR. CAMPBELL: Thank you Mike. So, with
3 that what I'm going to do is cover, in my closing
4 remarks, a recap and the path forward.

5 So, for future SRP revisions for SRP
6 Chapter 2.4, I'm on slide one of the closing remarks.
7 Hydrology is 2.4. So, updates are to be announced
8 in the Federal Register, and we'll have additional
9 public meetings to follow.

10 In particular, 2.4.1 will be announced.
11 And that really provides the overall scope and vision
12 that we have for the whole hydrology section. And
13 also, you know, the linkage to our risk informed
14 performance-based approach where revising the
15 Standard Review Plan.

16 The early calendar year 2019 updated
17 drafts will be announced in the Federal Register for,
18 as I just said, 2.4.1, the hydrologic description.
19 And 2.4.2, local intense precipitation.

20 Which Mike Lee, Dr. Mike Lee pointed out,
21 we found all of the sites were affected from the
22 Fukushima work. And that was mainly, let's keep it
23 clear, that was mainly because most sites did not
24 have a design basis for local intense precipitation.

25 And because we were asked, and the sites

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1 were -- the industry was asked to reevaluate their
2 local hazards with respect to their design basis,
3 essentially all of the sites didn't have a design
4 basis, or many of the sites, to all of them, didn't
5 have a design basis for flooding from a rainfall
6 event.

7 So, there are a whole series of
8 interactions that took place in terms of what do we
9 need to do? What does the industry need to do for
10 local intense precipitation?

11 And there is a White Paper that NRC
12 reviewed from NEI that looked at a variety of
13 different things that will be considered in -- for a
14 site, evaluating the impacts of local intense
15 precipitation on the site.

16 That doesn't necessarily mean every site
17 was challenged in terms of consequential flooding for
18 a particular event. It's just there was no design
19 basis set up for the many, many sites.

20 So, we also have -- will be presenting a
21 draft NUREG on site specific probable maximum
22 precipitation. For those of us that have been
23 involved in local intense precipitation reviews, the
24 hydrometeorologic reports produced by NOAA, are old.

25 They pretty much stopped producing them

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1 in the '80s in terms of updates. And so stepping
2 into that void, the private sector has developed
3 methodologies to evaluate locate intense
4 precipitation.

5 And we've reviewed a lot of these in the
6 -- over the course of the Fukushima work. As well
7 as some of the COLs.

8 And so with that we've learned something
9 about local intense precipitations in terms of -- and
10 flooding for whole watersheds, in terms of the site
11 specific probable maximum precipitation approaches
12 that pretty much follow the World Meteorological
13 Association guidance. But there are some
14 differences.

15 And so lessons learned from that, from a
16 large number of views, will be considered and laid
17 out in the NUREG. And then expectation Staff would
18 have for utilizing that information.

19 Also, SRP Section 2.4.8 cooling water
20 canals and reservoirs will be updated. And SRP
21 2.4.11, low water effects will be evaluated. And
22 these will be updated in the SRP.

23 So, future SRP revisions for SRP Chapters
24 2.3 and 2.5. So, 2.3 was climatology. So, 2.3.1 is
25 the regional climatology.

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1 This is late calendar -- I'm on slide two
2 of the closing remarks. 2.3.1 regional climatology
3 and 2.3.2 local meteorology will be sometime late in
4 calendar year 2019.

5 Also late in calendar year 2020, we are
6 going to have updated drafts announced in the
7 Federal Register for several geology sections. SRP
8 Section 2.5.1 which is geologic characterization
9 information, 2.5.2 vibratory ground motion, 2.5.4
10 stability of subsurface materials and foundations,
11 and SRP 2.5.5 stability of slope.

12 So this is -- these are our plans in terms
13 of these updates. And as I said earlier, we will be
14 having Federal Register notices for all of those.

15 So, next steps. I'm on slide three of
16 the closing remarks. So, this visit we want your
17 comments. We're in listening mode today.

18 We want to hear from you about what you
19 think about the sections that have been presented in
20 the Federal Register. And also your general thoughts
21 about the whole approach that we're having, that we're
22 talking about.

23 So the closing date for submission of
24 public comments for 2.3.3, 2.4.6, 2.4.9, and 2.5.3,
25 i.e., the sections we have talked about today, would

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1 be Monday, October 29, 2018. So that's the end of
2 the month.

3 Comments can either be submitted too
4 online. And that's a <http://www.regulations.gov>.
5 The Docket ID number is NRC-2018-0178.

6 Or you can mail it in, in the regular
7 mail care of Ms. May Ma, Office of Administration,
8 Mail Stop TWFN7. That's Two White Flint North 7.
9 A60M, that's a mail stop. U.S. Nuclear Regulatory
10 Commission, Washington, D.C. 20555-0001.

11 We intend to respond to all public
12 comments. And availability of public comments
13 disposition to accompany Federal Register notices
14 announcing the availability of the final revised SRP
15 sections.

16 So, as we announce the final, we will
17 have a full section of dispositioning every single
18 comment or set of comments that have been made on
19 that section.

20 For SRP sections discussed today, the
21 final SRP revisions are expected some time in calendar
22 year 2019.

23 And so with that I'm going to turn it
24 over to Dan Mussatti, our Facilitator. And we'll
25 open it up to public comments.

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1 Take it away Dan.

2 MR. MUSSATTI: All right. Thank you.
3 According to our agenda, it is now ten o'clock. And
4 we were planning on having a short ten minute break
5 in here before we start with the comments.

6 Which will give me an opportunity to try
7 an experiment here, since we haven't got the webinar
8 up and running because of some bandwidth issue or
9 whatever. We do have the phone lines open. And
10 we're hoping that the people that are on the phones
11 would have an opportunity to be able to ask their
12 questions live.

13 So, while everyone's taking a break here,
14 we're going to perform a small experiment to see if
15 we can actually communicate with the folks on the
16 phone. And have it heard in the room here and by our
17 court reporter.

18 So, if you could be back by ten after, I
19 would certainly appreciate it. And we stand
20 temporarily adjourned here.

21 Could I get the phone lines opened up so
22 we can see if we can communicate? Okay. Is there
23 anybody on the line?

24 (No response)

25 MR. MUSSATTI: If you're on the line,

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1 we're not able to hear you yet. We're still working
2 on it.

3 Okay. Mark, could you put slide three
4 up again so that I can read it off to these folks
5 that are on the phone in case they're still there?

6 Oh, you're calling in to see. Okay.

7 MR. NOTICH: We're going to experiment.

8 MR. MUSSATTI: Right. We have an
9 experimenter right here in the room. Yes, please.

10 In case you're on the phone and we're not
11 able to hear your comments live, please remember that
12 <http://www.regulations.gov> will gladly accept your
13 comments to us.

14 Just make sure you include the Docket ID,
15 NRC-2018-0178. That's probably your most efficient
16 way to be able to get that information to us.

17 That's also the -- on the last slide that
18 was presented by Andy just a few minutes ago.

19 And we're trying a live version. I've
20 got a gentleman in the room here that's trying to
21 call me live. You can hear me.

22 Okay. He can hear me, but I can't hear
23 him. Is there some setting in the booth that we can
24 play with?

25 Yeah, you're not coming over the

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1 speakers. Okay. It doesn't look like this
2 experiment has been very successful.

3 We will proceed with comments from
4 whoever is in the room when they get back. And when
5 there aren't any more comments, I guess we're done.

6 So, I'll see you at about ten after.

7 (Whereupon, the above-entitled matter
8 went off the record at 10:05 a.m. and
9 resumed at 10:16 a.m.)

10 MR. MUSSATTI: We are going to be
11 abandoning the telephone line that we have. And
12 we're going to open up a regular conference line
13 upstairs here that we should be able to have people
14 call in then.

15 So, it's going to take another minute or
16 two to be able to get that set up upstairs. And
17 until then, I don't think we're going to fill up a
18 full two hours with comments anyway. So, bear with
19 me, please.

20 MR. CAMPBELL: And are we going to
21 announce the number the number they need to call?

22 MR. MUSSATTI: We'll get the new number
23 here in a minute, as soon as we get the conference
24 information from the guy that just ran upstairs.

25 MR. CAMPBELL: Okay.

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1 MR. MUSSATTI: All right. We're ready
2 to make a change. Grab a pencil and a piece of paper
3 so you can write down some numbers.

4 And we're going to ask you to hang up in
5 a minute. And then to dial into this new number.
6 The toll-free number is (866) 617-1024.

7 Once again, that number is (866) 617-
8 1024. And we would like to have you use this pass
9 code to get into the line, 2406646. 2406646.

10 So if you've got that information now,
11 please hang up. And give it a good strong ten count.
12 And then try calling back in again to these new
13 numbers. Thank you.

14 (Phone dialing)

15 MR. MUSSATTI: This is the NRC.

16 (Phone speaking)

17 MR. MUSSATTI: Can you hear me now?

18 (Phone speaking)

19 MR. MUSSATTI: All right. We're going
20 to have to -- we're going to give it a little more
21 time as people are signing in here.

22 But, we're going to have to have just a
23 little bit of patience amongst you folks on the phone
24 as you're trying to make your comments. Eventually
25 you will be heard.

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1 But, when you're trying to talk over each
2 other it's going to be a little confusing. So, bear
3 with us, because we have no way to be able to really
4 manage who's talking next, other than you guys helping
5 us out with that as much as you possibly can.

6 So, we're back from our break. Hopefully
7 everyone had a chance to follow through this morning
8 on the slides that we had.

9 And we're going to take questions now.
10 I'm going to start with -- since we haven't heard
11 from you all day long, I'm going to start with one
12 question from on the phone first.

13 And please state your name and
14 affiliation when you start. I have no comments on
15 the phone?

16 (No response)

17 MR. MUSSATTI: Cool. We'll go to the
18 room then. Would somebody in the room like to speak?

19 (No response)

20 MR. MUSSATTI: This could be a very, very
21 fast comment section.

22 (No response)

23 MR. MUSSATTI: Back to the phones.
24 Anybody on the phone that would like to speak?

25 (No response)

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1 MR. MUSSATTI: Okay. Back to the room.

2 (No response)

3 MR. MUSSATTI: All right. Einstein said
4 that insanity is defined as doing the same thing over
5 again and expecting a different result. I'm only
6 going to do this one more time.

7 Back to the phones. Is there somebody
8 on the phone would like to make a comment?

9 (No response)

10 MR. MUSSATTI: And now back to the room.

11 (No response)

12 MR. MUSSATTI: Okay. Andy?

13 MR. CAMPBELL: Okay. So this is Andy
14 Campbell. Maybe I can stimulate some questions.

15 One of the things we wanted to get
16 information on was not just your input on these
17 particular sections, but the overall approach to
18 revising the SRP.

19 Are there any comments on that overall
20 approach? Both as articulated by our Office
21 Director, Fred and by myself, as well as the Staff
22 approaches that you saw in each of these sections
23 that you can see in the slides.

24 Anybody on the phone want to make
25 comments about that?

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1 (No response)

2 MR. CAMPBELL: So, let me repeat the next
3 steps in terms of public comments. Even though there
4 may not be some comments at this point, we do direct
5 people to the slide deck on the public meeting
6 announcement.

7 The closing date for a submission of
8 public comments on SRP Sections that are in that slide
9 deck that we've talked about today, the hydrology,
10 the meteorology monitoring, and the ground
11 deformation section, and the tsunami section and the
12 channel migration section at 2.4.

13 The closing date is the end of the month.
14 Not quite the end of the month, but October 29.
15 That's next Monday. And with that said, you know,
16 if someone feels the need for an extension, we will
17 consider that.

18 And again, www.regulations.gov. With
19 Docket ID Number NRC-2018-0178.

20 (Background noise)

21 MR. CAMPBELL: Was that a comment?

22 (No response)

23 MR. CAMPBELL: Okay. And then you can
24 also respond via standard mail to Ms. May Ma, Office
25 of Administration, Mail Stop --

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1 (Telephone interference)

2 MR. CAMPBELL: BWFN-7-A60M, U.S. Nuclear
3 Regulatory Commission, Washington, D.C. 20555-0001.

4 And so with that, I'm going to turn it
5 back to Dan.

6 MR. MUSSATTI: Okay. Normally by now
7 I'd be reminding you that we need you to fill out
8 your feedback form for us. But, I'm pretty sure I
9 know what the feedback's going to be on this meeting.

10 I'd like to again apologize and voice our
11 frustration here that the electronics didn't work as
12 well as we wanted it to today. I'm hoping the meeting
13 was informative to everybody.

14 This isn't the only meeting that's going
15 to be on this. There's going to be other
16 opportunities for people to comment on the SRPs
17 further on down the line as well.

18 And what I'd like to do is adjourn the
19 meeting. I don't think there's anything left to do,
20 is there?

21 (No response)

22 MR. MUSSATTI: All right. Well, we'll
23 see you the next time. And thank you up in the booth
24 for all your help.

25 (Whereupon, the above-entitled matter

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1 went off the record at 10:22 a.m.)
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