



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001**

April 17, 2014

MEMORANDUM TO: ACRS Members

FROM: Derek A. Widmayer, Senior Staff Scientist /RA/
Technical Support Branch, ACRS

SUBJECT: CERTIFIED MINUTES FOR THE ACRS FUKUSHIMA
SUBCOMMITTEE MEETING, APRIL 10, 2013 – ROCKVILLE,
MARYLAND

The minutes of the subject meeting have been certified on January 17, 2014, as the official record of the proceedings for that meeting. Copies of the certification letter and minutes are attached.

Attachment: Certified Minutes

cc:
E. Hackett
T. Santos



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001**

MEMORANDUM TO: Derek A. Widmayer, Senior Staff Scientist
Technical Support Branch, ACRS

FROM: Dr. Stephen Schultz, Chairman
Fukushima Subcommittee

SUBJECT: CERTIFICATION OF THE MINUTES FOR THE MEETING OF
THE FUKUSHIMA SUBCOMMITTEE, APRIL 10, 2013 –
ROCKVILLE, MARYLAND

I hereby certify, to the best of my knowledge and belief, that the minutes of the subject meeting on April 10, 2013, are an accurate record of the proceedings of that meeting.

 / RA / 01/17/2014

Stephen Schultz, Chairman
Fukushima Subcommittee

Date

**ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
FUKUSHIMA SUBCOMMITTEE MEETING
MINUTES
April 10, 2013
Rockville, MD**

The Advisory Committee on Reactor Safeguards (ACRS) Fukushima Subcommittee met on April 10, 2013, at 11545 Rockville Pike, Rockville, MD, in Room T2-B1. The meeting was convened at 8:30 am and adjourned at 11:52 am.

The entire meeting was open to the public. Mr. Derek A. Widmayer was the cognizant ACRS staff scientist and the Designated Federal Official for this meeting. No written comments or requests from members of the public for time to make an oral statement were received from members of the public concerning this meeting.

ATTENDEES

ACRS

S. Schultz, Chairman
M. Ryan, Member
D. Skillman, Member
H. Ray, Member
S. Armijo, Member
D. Bley, Member
J. Stetkar, Member
B. Shack, Member
M. Corradini, Member
J. Rempe, Member
D. Widmayer, ACRS Staff

NRC Staff

L. Regner, NRR/JLD
C. Munson, NRO/DSEA
S. Stovall, RES/DE
B. Hill, NRO/DSEA
V. Graizer, NRO/DSEA
S. Tabatabai, NRO/DSEA
R. Roche-Rivera, RES/DE
A. Istar, NRO/DE
J. Chuang, NRO/DE
M. Patterson, NRO/DSEA
K. Manoly, NRR/DE
S. Laur, NRR/DRA

N. Chokshi, NRO/DSEA
A. Kammerer, NRO/DSEA
J. Ake, RES/DE
R. Karas, NRO/DSEA
D. Seber, NRO/DSE
M. Valentin, NRO/DE
S. Park, NRO/DE
P.-Y. Chen, NRO/DE
S. Devlin, NRO/DSEA
W. Orders, NRR/JLD
M. Flanagan, NRR/JLD
V. Thomas, NRO/DE

Others

J. Bergmann, Sciencetech
K. Keithline, NEI
J. Richards, EPRI

B. Whorton, SCE&G
J. Kimball, DNFSB
S. Malushte, Bechtel

SUMMARY

The purpose of the meeting was to review and discuss guidance documents for seismic reevaluations that respond to the March 2012 10 CFR 50.54(f) letters sent to applicants and licensees in fulfillment of Recommendation 2.1 of the Fukushima Near-Term Task Force (NTTF) Report. The meeting was planned as an Information Only Briefing. The Subcommittee planned to gather information, analyze relevant issues and facts, and formulate proposed positions and actions, as appropriate, and determine if the matter needed to be brought to the Full Committee for deliberation.

<i>SIGNIFICANT ISSUES</i>	<i>Reference Transcript Pages</i>
<p>N. Chokshi introduced the topics for the presentation and the speakers. He also provided a brief overview of the process used for developing the main guidance document (known as the SPID) for conducting the seismic reevaluations requested in the 50.54(f) letter</p> <p>Members of the Subcommittee had no issues during this presentation from staff.</p>	<p>6 – 10 (Slides Pgs 152 - 155)</p>
<p>J. Ake presented the bulk of the staff presentation on the technical evaluations and guidance contained in the first two chapters of the SPID guidance document.</p> <p>Members of the Subcommittee brought up the following issues during this presentation from staff:</p> <ul style="list-style-type: none">- The schedule for completing the requested assessments for the Eastern and Central US plants, and the Western US plants, and what issues are impacting the schedule (Schultz)- The use of a SSHAC Level 2 process, and what provides the staff with confidence that this was thorough enough, and what criteria is used to define the “interpretations” used in the process, and the data uncertainty associated with those interpretations (Skillman, Brown)	<p>10 – 40 (Slides Pgs 156 - 165)</p> <p>18 – 20</p> <p>20 - 25</p>
<p>J. Ake provided information on the Non-concurrence filed on the endorsement of the SPID document and the resolution agreed to be NRC staff and management to address the non-concurrence issues.</p> <p>Members of the Subcommittee brought up the following issue during this presentation from staff:</p>	<p>40 – 54 (Slides Pg 166)</p>

<ul style="list-style-type: none"> - The conclusion of the staff that the SPID process results in a “conservative” analysis, when addressing the non-concurrence issue regarding a site where no new data is required to be collected (Rempe) 	<p>49 – 53</p>
<p>C. Munson continued the presentation on the guidance contained in the SPID document.</p> <p>Members of the Subcommittee brought up the following issues during this presentation from staff:</p> <ul style="list-style-type: none"> - Why the 1- 10 Hz range is most important given the experiences with European reactors where a different range is focused on (Skillman) - The use of the dual criteria (number of as well as amount of exceedance) for exceeding the GMRS frequency ranges and its application in the screening process – when a plant must opt in or out of further detailed evaluations. (Skillman) 	<p>55 – 76 (Slides Pgs 167 - 170)</p> <p>57 – 60</p> <p>69 – 75</p>
<p>N. Chokshi continued the staff presentation on the key staff and industry positions documented in the SPID and the component testing being conducted by the industry.</p> <p>Members of the Subcommittee brought up the following issues during this presentation from staff:</p> <ul style="list-style-type: none"> - The tests for the high-frequency sensitive components – the protocols to be used, the two Phased approach, the sampling methodology, where the sample equipment will be obtained, and how replacement components will be tested (Stetkar, Bley, Brown) - The allowance for operator actions in certain parts of the evaluations in the SPID (Stetkar, Bley) - The proposed “in-process” peer review and the definition of “independent” for members of an in-process peer review, the support of the industry for this approach, the applicability of the NEI guidance for peer review, and which members (or all) do the final report (Bley, Schultz) - Whether or not the specific scenario of a seismic failure that can result in a drawdown of the spent fuel pool during other than normal operations should be included (Stetkar) - That all the attention to details in conducting this phase of the reevaluations will result in forgetting about or lack of 	<p>76 – 132 (Slides Pgs 171 - 185)</p> <p>86 – 101</p> <p>101 – 108</p> <p>112 – 119</p> <p>120 -123</p> <p>124 – 132</p>

attention to the final result, which is what regulatory actions are going to be needed - the Phase II of Recommendation 2.1 of the NTTF (Ray)	
N. Chokshi completed the staff presentation by discussing the augmented approach for conducting the seismic reevaluations proposed by NEI and the path forward. Members of the Subcommittee had no issues during this presentation from staff.	133- 146 (Slides Pgs 186 - 188)

ACTION ITEMS	Reference Transcript Pages
Staff was to provide the NEI Letter containing the industry proposal for "Augmented Approach for 50.54(f) Seismic Reevaluations," to ACRS staff for distribution to the SC members (<i>Completed 04/10/2013</i>)	139

ATTACHMENT

Official Transcript of Proceedings, Meeting of ACRS Fukushima Subcommittee, April 10, 2013, Rockville, MD.

Documents Provided to the Subcommittee:

1. Electric Power Research Institute, "Seismic Evaluation Guidance, Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic," EPRI, February 2013. (ML12310A006)
2. Non-concurrence Process Documentation for NCP-2012-009, "Endorsement of Electric Power Research Institute Final Draft Report 10252," December 12, 2012. (ML13058A374)
3. U.S. NRC, "Guidance on Performing a Seismic Margin Assessment in Response to the March 2012 Request for Information Letter," JLD-ISG-2012-04, Revision 0, November 16, 2012 (ML12286A029)

Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards
Fukushima Subcommittee

Docket Number: (n/a)

Location: Rockville, Maryland

Date: Wednesday, April 10, 2013

Work Order No.: NRC-4114

Pages 1-150

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

FUKUSHIMA SUBCOMMITTEE

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WEDNESDAY

APRIL 10, 2013

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ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear
Regulatory Commission, Two White Flint North, Room
T2B1, 11545 Rockville Pike, at 8:30 a.m., STEPHEN P.
SCHULTZ, Chairman, presiding.

1 COMMITTEE MEMBERS:

2 STEPHEN P. SCHULTZ, Chairman

3 J. SAM ARMIJO, Member

4 DENNIS C. BLEY, Member

5 CHARLES H. BROWN, JR. Member

6 MICHAEL L. CORRADINI, Member

7 HAROLD B. RAY, Member

8 JOY REMPE, Member

9 MICHAEL T. RYAN, Member

10 WILLIAM J. SHACK, Member

11 GORDON R. SKILLMAN, Member

12 JOHN W. STETKAR, Member

13
14 DESIGNATED FEDERAL OFFICIAL:15 DEREK WIDMAYER
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P R O C E E D I N G S

(8:31 a.m.)

CHAIRMAN SCHULTZ: Good morning. The meeting will now come to order. This is a meeting of the Advisory Committee on Reactor Safeguards Fukushima Subcommittee. I'm Stephen Schultz, the Chairman of the Subcommittee. ACRS members in attendance are Dick Skillman, Harold Ray, Dennis Bley, Sam Armijo, John Stetkar, Mike Ryan, Bill Shack, Joy Rempe, and Mike Corradini.

The purpose of this meeting is to review and discuss the guidance document developed by NEI and endorsed by the NRC staff for seismic hazard re-evaluations to fulfill the requirements of the Near-Term Task Force recommendations for enhancing reactor safety in the 21st century.

The staff will also provide information on a nonconcurrence, which was filed regarding the NRC's endorsement of the main guidance document for conducting the seismic re-evaluations and provide the final NRC endorsement letter which contains information that resolved the non-concurrence issues.

The seismic hazard re-evaluations are recommended in the NTTF report in recommendation 2.1. The main guidance document that will be discussed in

1 this meeting is, Seismic Evaluation Guidance:
2 Screening, Prioritization, and Implementation Details,
3 effectonately known as SPID, for the resolution of
4 Fukushima Near-Term Task Force Recommendation 2.1:
5 Seismic.

6 The staff will also briefly discuss and
7 address the final version of and issuance of the
8 guidance document brief to the Fukushima subcommittee
9 on August 15th, 2012, which was guidance on performing
10 a seismic margin assessment in response to the March
11 2012 request for information letter JLD-ISG-2012-04.

12 The subcommittee will gather information,
13 analyze relevant issues and facts, and formulate
14 proposed positions and actions as appropriate for
15 deliberation by the full committee if this is decided
16 following the conclusions of this meeting. I would
17 like to say that, as you can see by the introduction,
18 there has been a tremendous amount of work done by the
19 staff, and the public, associated with this issue over
20 the past two years and before.

21 This was an issue that began prior to the
22 Fukushima event, and I say it's a tremendous amount of
23 work in a short period of time, because if anyone is
24 familiar with activities similar to this that happened
25 some decades ago, one and two, three decades ago,

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1 those efforts last a lot longer. A lot of expertise
2 has been put into this issue in a short period of
3 time.

4 The meeting this morning is open to the
5 public. The rules for participation in today's
6 meeting have been announced as part of the notice of
7 this meeting, previously published in the Federal
8 Register. We have received no written comments or
9 requests for time to make oral statements for members
10 of the public regarding today's meeting. Derek
11 Widmayer is the designated federal official for the
12 meeting.

13 A transcript for the meeting is being kept
14 and will be made available on the Web. I know that
15 there are some participants in today's meeting who are
16 on the bridge line. It's requested that all speakers
17 first identify themselves and then speak with
18 sufficient clarity and volume so that they can be
19 readily heard. Thank you.

20 We'll now proceed with the meeting and I
21 call on Nilesh Chokshi, Deputy Division Director of
22 Site, Safety, and Environmental Analysis in the Office
23 of New Reactors to open the proceedings. Nilesh, good
24 morning.

25 → MR. CHOKSHI: Good morning, and thank you,

1 Dr. Schultz, and thanks for delaying this presentation
2 while we are working through some of the technical
3 issues. At the table with me is Dr. Cliff Munson, Dr.
4 Jon Ake, Dr. Kammerer, and Lisa Regner, she's a
5 project manager, she makes sure everything comes
6 together. Also, on the phone line, we have Dr.
7 Budnitz and Dr. Ravinda.

8 And as you mentioned, Dr. Schultz, the
9 SPID, and I'll start using SPID because you already
10 introduced, is an industry document with a lot of
11 input and interactions with NRC, and we have Kimberly
12 Keithline, who led the industry effort, and two of the
13 members of the industry task force, John Richards and
14 Bob Whorton, so I think it's good that some of the
15 details, they are very familiar with particular parts
16 of the program, so they can answer, also, questions.

17 CHAIRMAN SCHULTZ: Thank you. We look
18 forward to their participation.

19 MR. CHOKSHI: So as you mentioned, let's
20 go to the next slide, we're going to cover, basically,
21 the three things and spend most of the time on the
22 SPID. We'll walk you through both the hazard part,
23 the risk evaluation part, and couple of other topics,
24 and then Jon, Cliff, and I are going to primarily
25 conduct that part of the presentation. NRC seismic

1 margin, as you mentioned, is just to tell you where we
2 are. We briefed you, technical portions haven't
3 changed, so I just want to let you know, you know,
4 exactly how they turned out.

5 And then also need to talk about, I'm sure
6 you heard about this industry proposed alternative
7 approach and where we are. I think we have taken a
8 big step forward yesterday. In fact, after we
9 prepared this presentation, the industry proposal is
10 now formally here, and I'll talk more about that --

11 CHAIRMAN SCHULTZ: Yes.

12 MR. CHOKSHI: -- with the guidance
13 document. Okay. So that's the goal to go through,
14 you know, those three topics and I'll start. Let me
15 just give you an overview of the SPID and let me go
16 back. Next slide. I think Dr. Schultz, you already
17 mentioned that, it was the final draft was submitted
18 to us in November 2012 after intensive interactions
19 and a number of public meetings, and which involved,
20 I think, as you see at this table, from NRC side,
21 let's start from the number of offices.

22 You know, Annie and Joan from the
23 research, JLD people, and there is other technical
24 people, so it was a counterpart of an industry task
25 force that was a team, NRC team, which interacted.

1 And then we endorsed the guidance on February 5th,
2 okay? And so that will be, now, the guidance that
3 will be used in response to the Recommendation 2.1.

4 Just to give you what's in the SPID, there
5 are, basically, seven sections; 2 and 3, well, 2, 3,
6 and 4, to some extent, deals with a lot of hazard
7 issues and also, issues related to the screening, and
8 we'll be walking through that, and Jon and Cliff will
9 cover that, and then I will talk about Chapter 6,
10 which is a seismic risk evaluation, and compares a
11 number of topics related to the planned evaluations
12 and performing seismic risk or seismic margin
13 analysis.

14 And then we'll also touch briefly on the
15 spent fuel pool, it's a little bit different than the
16 rest of the evaluation, but there's a guidance, also,
17 on that, so I will cover. Now, all these topics can
18 take a lot of time, so we're going to try to cover at
19 a high level to give you a feel for what are the
20 technical approaches and positions. Luckily, when we
21 briefed you on the SMA, we had residualized some of
22 these positions, so they were covered in some details,
23 so you'll see some slides, probably, familiar, okay?

24 And this is a substantial document and
25 there are four appendices with more details. Also,

1 behind these, there were a number of studies conducted
2 to provide a basis for the positions, so I'll mention
3 them as we go along, and we'll mention those studies.
4 So I think this is a substantial document, and given
5 the time, I think we'll give you the, you know, more
6 complete picture, but not necessarily go down to the
7 very deep details.

8 CHAIRMAN SCHULTZ: Thank you, Nilesh.

9 MR. CHOKSHI: So with that, I think I'm
10 going to -- Jon, are you going to start with the
11 hazard and screening key positions, and then go to the
12 slide? Jon is going to cover these topics in details,
13 so I won't take too much time, we'll talk about the
14 three main parts of the seismic hazard re-evaluations,
15 positions, and discussions, and then on the screening
16 of research, how do the plans go into the next phase,
17 whether they are to do the seismic risk evaluation or
18 not, and how the criteria to determine what will work
19 to make that determination.

20 So I think with that brief introduction,
21 Jon.

22 → MR. AKE: Okay. If we can move to the
23 next slide. Yes, I'm going to talk a little bit about
24 Chapter 2 of the SPID and the request in the request
25 for information 50.54(f) letter requested the

1 operating reactors to develop site-specific estimates
2 of the seismic hazard or ground shaking at each of the
3 operating reactor sites.

4 And Chapter 2 of the SPID, along with of
5 the appendices, Appendix B, describes the proposed
6 path for conducting that. And this particular figure,
7 schematically, illustrates that this process is really
8 broken down, or can be thought of as being broken
9 down, into three different pieces. First is the so-
10 called seismic source characterization, that part of
11 the problem where we identify where earthquakes might
12 occur, how big they might be, and importantly, how
13 often they might occur.

14 Then, given the occurrence of an
15 earthquake, the ground starts shaking, how those
16 ground motions are modified, or attenuated, or their
17 frequency content changes as they travel from the
18 seismic source to our site of interest. And then
19 lastly, how the very near surface materials beneath
20 the operating reactor site amplify, or de-amplify, or
21 change the frequency content of those incident waves
22 and then the seismic demands, ultimately, that arise
23 within the structure itself.

24 So I'm going to talk, in the next few
25 slides, about those three different component pieces

1 and how it's being addressed in the SPID. Next slide,
2 please. There's a slight difference in the approaches
3 that are being taken between the Eastern United States
4 and plants located in the Western United States, and
5 I'll touch on the reasons for that in just a moment.
6 But for the Central and Eastern United States, those
7 plants will use the latest regionally developed models
8 for seismic source characterization, which I believe
9 the committee has been briefed upon before, and that's
10 the so-called Central and Eastern United States
11 Seismic Source Characterization Project, or model,
12 that was developed over the last three-plus years, or
13 four-plus years, I guess, a cooperative agreement
14 between EPRI, the industry, via EPRI, the DOE, and the
15 NRC, and that's documented in NUREG-2115.

16 The slide on the right is an example of
17 the breakdown of the larger regional of the Central
18 and Eastern United States into different seismic
19 source zones. In addition to that, for the ground
20 motion part of the problem, the 50.54(f) letter
21 indicated that staff would find it acceptable to use
22 the 2004, 2006 regional ground motion model developed
23 by EPRI to conduct those site-specific hazard
24 evaluations.

25 There is an update to that model, it is in

1 progress at this time, that I'll touch on in a little
2 bit more detail in a moment. So the EPRI 2004 model
3 is specifically designed to produce ground motion
4 estimates for hard rock site conditions, so those
5 regional models could be used to develop the hard rock
6 seismic hazard at each Central and Eastern United
7 States reactor location. Next slide, please.

8 And I'll go over the details of the site
9 response calculations in a moment here. A little bit
10 of background on the EPRI ground motion model for the
11 Central and Eastern United States. We previously
12 endorsed that model in the 50.54(f) letter. Industry,
13 based upon the fact that that model was actually --
14 the documentation was finished in 2004, but the actual
15 development of the model occurred in about 2001, 2002
16 time frame.

17 The industry decided that updating that
18 model was warranted at this time and they proceeded
19 along the path of doing a SSHAC process, or Senior
20 Seismic Hazard Analysis Committee, or process, to
21 develop that update. The industry requested staff
22 endorsement by the end of February of this year in
23 order to meet the September 2013 deadline for
24 computing the hazard re-evaluations, which is what's
25 specified in the 50.54(f) letter.

1 In the briefing in the middle of February,
2 the staff was unable to endorse that model at that
3 time, and it was based, primarily, on two particular
4 issues; one, the treatment of uncertainty within that
5 model, as in the updated model, and also, the adequacy
6 of the documentation that was available at that time.
7 Next slide, please.

8 So the EPRI ground motion model, the
9 update to that ground motion model, where we are
10 currently is that, the industry presented a refined
11 and updated version at a public meeting on March 26th
12 that occurred here at headquarters. The staff
13 concludes that that updated model does appear to
14 address most of the issues that were raised by the
15 SSHAC peer reviewers as well as the NRC staff.

16 We should emphasize that, primarily, at
17 this point in time, since it is being conducted as a
18 Senior Seismic Hazard Analysis Committee, or SSHAC
19 process, they have an independent peer review panel
20 that is involved in the evaluation of the model itself
21 as this process is going along, that the NRC review
22 process is somewhat in parallel to that at this point
23 in time.

24 The industry requested a six-month delay
25 for the hazard submittals for the Central and Eastern

1 United States plants based on performing this update.
2 That would move the hazard submittals from September
3 of this year to March of 2014, if that requested delay
4 is granted.

5 MR. MUNSON: I just wanted to interject
6 one point. We have a more complete presentation on
7 this tomorrow afternoon, so we have about 10 or 11
8 slides that discuss the issues more fully, so
9 tomorrow, we'll go over that.

10 CHAIRMAN SCHULTZ: For members in the
11 audience, or on the bridge line, what Cliff is
12 referring to is a briefing that's been scheduled for
13 the ACRS fully committee tomorrow. We'll hear more
14 about the ground motion model then.

15 MR. AKE: Right. And obviously, our
16 endorsement of that will depend upon seeing the draft
17 final report of this updated project and the
18 documentation. And obviously, our endorsement will
19 depend heavily upon the adequacy of that
20 documentation, which we have not as yet seen. Next
21 slide, please.

22 For those plants that are located in the
23 Western United States, the seismic source
24 characterization is somewhat different. Thinking back
25 about the Central and the Eastern United States, there

1 are very few identified faults that project all the
2 way to the surface that are characterized in the
3 seismic source characterization model. The Central
4 and Eastern United States does have earthquakes,
5 however, they are generally not associated with faults
6 that we can identify on the surface of the Earth.

7 And that's not necessarily the case when
8 we look in places in the Western United States. This
9 particular slide on the right-hand side is a map from
10 the seismic hazard analysis of California, and you can
11 see there are a large number of lines on that map.
12 Those are all active faults, or seismic sources, that
13 are identified by the State of California and the
14 United States Geological Survey in California.

15 So there are a large number of identified
16 seismic sources that are within relative proximity of
17 some of the existing operating reactors in the Western
18 United States, so the emphasis in the seismic source
19 characterization is somewhat different and much more
20 site-specific than it is in the Eastern United States.
21 And as a result, for the Western United States plants,
22 the seismic source characterization process is being
23 done on a much more site-specific basis and all of the
24 plants are currently following a SSHAC Level III
25 process, which is a fairly rigorous and demanding

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1 process with a series of at least three workshops that
2 are conducted on various aspects of the source
3 characterization.

4 It's also important to point out that, for
5 the Eastern United States, there is not a great deal
6 of data that does exist, ground motion data that does
7 exist, for the magnitude and distance ranges that we
8 are most concerned about from an engineering
9 perspective, and that's not the case in the Western
10 United States. There is much more data available to
11 develop the ground motion model, so they rely much
12 less on simulations and much more on actual data.

13 So each of the four plants in the Western
14 United States, Palo Verde, San Onofre, Diablo Canyon,
15 and Columbia are proceeding to do a seismic source
16 characterization project, SSHAC Level III; each one of
17 those sites. However, the ground motion model, a
18 site-specific model, is being developed for Columbia.
19 And the Columbia project is jointly partnering on
20 their project with the DOE Hanford site, since
21 they're, basically, co-located with the Hanford site.

22 And a regional ground motion model is
23 being developed jointly by Diablo Canyon, San Onofre,
24 and Palo Verde, and that will be a model that will be
25 applicable for Southern California, Western Arizona

1 area.

2 → CHAIRMAN SCHULTZ: Jon, what is the rough
3 schedule associated with that work and how much review
4 time do you anticipate once the models are completed?

5 MR. AKE: Good question. Those will be
6 done in the next 18 months, approximately 18 months,
7 for all those studies. The staff is attempting to
8 attend all of those various workshops and stay abreast
9 of what's going on. We're trying to do it as
10 independent observers rather than not as part of the
11 formal peer review panel. Each of these different
12 projects has a formal SSHAC peer review panel
13 associated with it. We are trying to do it as
14 independent observers, to try and watch the process
15 itself, as well as the technical details.

16 And I guess the thrust of your question
17 is, once those are submitted to us, what is the review
18 schedule?

19 CHAIRMAN SCHULTZ: That's correct.

20 MR. AKE: And I'm not sure we've --

21 MR. MUNSON: Yes, we haven't really
22 actually discussed that in much detail. We allotted
23 a three-year period for the Western U.S. sites to do
24 their SSHAC studies, as opposed to the Central and
25 Eastern U.S., where they already had a regional model

1 available that was approved by the NRC staff, they had
2 a year and a half, which is going to extend to two
3 years.

4 So there's a three-year period, those come
5 in in March 2015, and so when those hazards come in,
6 I imagine at least a year, depending on how much, you
7 know, we have contracting resources, we have staff
8 resources, so we'll probably have at least a year or
9 so to review the submittals when they come in.

10 MR. CHOKSHI: You know, the focus,
11 currently, is on the Central, Eastern plants, because
12 they are coming in sooner, so we have developed review
13 plans, and resources, and, you know, there's a plan
14 for this. And then the next thing is to plan, in more
15 detail, the Western U.S. So right now, the focus is
16 -- you know, because they were supposed to come in
17 September, now we will hear, maybe, March 2014, but
18 that's more near-term activity, so that's where the
19 planning is focused.

20 CHAIRMAN SCHULTZ: That gives us a good
21 perspective. Thank you.

22 MEMBER SKILLMAN: I'd like to ask a
23 question on your second bullet, please.

24 MR. AKE: Sure.

25 → MEMBER SKILLMAN: Much credit is being

1 given to the SSHAC Level III process, what gives you
2 confidence that that process is going to give you a
3 firm, accurate basis for siting for those four sites
4 on the West Coast?

5 MR. AKE: The thrust of that process is to
6 recognize that, for most of these questions, data does
7 not exist to allow unambiguous interpretations. And
8 there are a variety of interpretations that are
9 permissive with the data, may be permissive of, if you
10 will, and that there are a number of different
11 conceptual models that could be used to explain the
12 occurrence of earthquakes or the characteristics of
13 ground motions.

14 And the whole process is built around
15 trying to ensure that the uncertainty that is
16 associated with those different interpretations is
17 represented reasonably and accurately, and propagated
18 through the whole process. That's the fundamental
19 structure of what the SSHAC process is about, is
20 building something that recognizes that, how the study
21 is conducted can influence the end result.

22 MR. CHOKSHI: I think work gives of
23 confidence. You know, this was developed based on the
24 past experience with Livermore and EPRI. That's why
25 you look at, holistically, how do we do this, and so

1 it has been in existence for now, more than 20 years,
2 and has been applied, used at, a number of places now,
3 both in U.S. and other places. We have learned
4 lessons, which were captured in the 211 file, so the
5 process has matured and, I think, has shown that it
6 can be, you know, applied correctly and has a
7 confidence, so I think there is enough experience with
8 that.

9 MR. MUNSON: I think Annie wants to point
10 out, I mean, this is a good thing, NUREG-2117, which,
11 John and Annie worked on it, is an update, or lessons
12 learned, kind of from the SSHAC process and how we
13 conduct SSHAC Level IIIs, and so it's an update
14 guidance document on the process, and I would
15 recommend, if you're interested to look at that.

16 One thing I'd also point out is, there are
17 many programs in the Western U.S., specifically
18 California, to model ground motions. There's a
19 project called NGA West where they're developing the
20 latest ground motion models for the West. There's
21 Southern California Earthquake Center, which does a
22 lot of modeling in the Southern California area, and
23 so these SSHAC projects are able to rely on those
24 previous efforts and those ongoing efforts to
25 characterize the hazard for the West.

1 MEMBER SKILLMAN: Thank you.

2 MR. AKE: Any other questions before we
3 move on?

4 MEMBER BROWN: Yes, you used the word,
5 interpretations, and since I'm the uninitiated on a
6 seismic basis, what do you mean by, interpretations of
7 what in terms of developing the process? I mean, is
8 it data? Is it interpretations? Do people really
9 know what this data represents? I did not understand
10 what you were talking about?

11 MR. MUNSON: Yes, so for example, on one
12 of those faults that's shown, drawn, on the map there,
13 the question is, what size earthquakes can that
14 produce? Is it a magnitude 6 or can we actually go up
15 to magnitude 7? So there's different interpretations.
16 Is it the style of faulting strike slip, or is it more
17 of a thrusting motion? So, you know, you characterize
18 different interpretations of the fault and the
19 sources, as well as, also, the ground motion; trying
20 to predict the ground motion values for different
21 magnitudes and distance ranges.

22 So there's different interpretations that
23 the SSHAC process incorporates.

24 MS. KAMMERER: To answer, I think, more
25 fully, it's based on a series of types of data,

1 different types of data, so it's the seismicity, it's
2 the tectonics, it's the geology, it's paleo
3 information. So one of the things that the SSHAC
4 process does is take a series of datasets that are
5 available, as Jon said, sometimes these datasets are
6 permissible of multiple interpretations.

7 MEMBER BROWN: Let me condense that just
8 a little bit. If I understand it, you're saying
9 you've got data, you know there's a fault, you know it
10 has some physical characteristic, and it's just a
11 matter of figuring out how much ground motion can
12 result from any motion of that, and that's where the
13 uncertainty comes in? So people have different
14 opinions? If that's what you mean by interpretations,
15 I will simplify it down to something my somewhat pygmy
16 brain can absorb here.

17 MS. KAMMERER: Yes, the characterization
18 of exactly where it is and exactly what it's geometry
19 is, and things like that, though, it's not crystal
20 clear.

21 MEMBER BROWN: No, I just needed to
22 understand what you meant by interpretations and I
23 think I have this view, not necessarily the detailed
24 view, but that's fine. I understand all that. I
25 understand the terminology you used and what you mean

1 by it.

2 MEMBER CORRADINI: Since I'm similar to
3 Charlie in that I don't really completely understand
4 the underlying science, what you're really telling us
5 is, the SSHAC committee has to come up with, I'll call
6 them, scenarios on how all this fits together and the
7 ensemble of the SSHAC committee's scenarios is what,
8 essentially, gives you the seismic source and the
9 ground motion. Excuse me, the seismic source.

10 MR. AKE: Seismic sources.

11 MEMBER CORRADINI: Okay.

12 MR. AKE: Because you characterize, that's
13 one of the things in this process, the so-called
14 probabilistic seismic hazard analysis. You're
15 characterizing all of the sources in the area.

16 MEMBER CORRADINI: And the interpretation
17 of what those sources are.

18 MR. AKE: Right. And an example of an
19 interpretation in this particular case might be, you
20 know, I don't have a very good -- I'm just seeing
21 here. There's not a particularly great example on
22 that figure, but I think, for example, if we have a
23 fault that's mapped, that people agree, yes, this is
24 a fault, and it's, maybe, 30 kilometers long, let's
25 say, for example, and at the southern end it looks

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1 somewhat like a Y, there's another fault that splays
2 off of that.

3 An example of an interpretation might be,
4 when this fault produces earthquakes, does it produce
5 earthquakes only on the main strand or is the Y-branch
6 down here involved at all times? So you end up with
7 interpretations like that where the geological
8 observations, especially, are those that don't
9 necessarily lend themselves to unique interpretations.
10 You know, that's the kind of multiple interpretations
11 that are captured within that process.

12 MS. KAMMERER: And it's characterized in
13 a logic tree framework. So you have these, we call
14 it, the center, body, and range of technically
15 defensible interpretations.

16 MEMBER CORRADINI: Okay. It's a
17 methodology for diverse opinions on limited and
18 interesting data.

19 CHAIRMAN SCHULTZ: Go ahead, Jon. Thank
20 you.

21 MR. AKE: Okay. We'll move on here to
22 site response. So the last part of that picture that
23 we showed, that schematic diagram we showed, when we
24 began this part of the discussion, was the so-called
25 site response, or what happens in those last few

1 hundreds of meters up to the surface beneath the
2 reactor itself, or our site of interest.

3 And for all those sites that are not sited
4 on hard rock, and I should have mentioned this a
5 moment ago, and I'll point it out now, the ground
6 motion equations that are being developed, both for
7 the Western United States and the Eastern United
8 States, are for hard rock site conditions. And so any
9 deviation, if the plant itself is not sited on very
10 hard rock, we need to make some evaluation of the
11 amplifications that may occur near surface as the
12 waves travel upwards beneath the reactor.

13 And the particular things that we need to
14 characterize for each site, then, are, what are the
15 layers of these soil units, or soft rock units, that
16 occur above the so-called basement, or very hard rock,
17 site conditions? How thick are those layers? What
18 are the various physical, mechanical properties, like
19 the shear wave velocity? What are their densities?

20 And if they're soils, what kind of non-
21 linear properties might those soils exhibit when we
22 pass very high amplitude seismic waves through those
23 soils, they may behave non-linearly, we need to
24 characterize the non-linear properties of those soils.
25 And also, for all of those different things, those

1 four different items I outlined there, we also have to
2 characterize the uncertainty in each of those
3 different things that we're characterizing and find a
4 way to propagate those uncertainties through the
5 process.

6 MEMBER STETKAR: Jon? To give the members
7 an appreciation for the importance of this part of the
8 analysis, approximately what fraction of the sites in
9 the Central and Eastern U.S. are either hard rock or
10 are not hard rock sites?

11 MR. AKE: Yes, one minus or --

12 MEMBER STETKAR: Yes. Give us the hard
13 rock sites.

14 MR. AKE: Well, you know, that's something
15 that I have to say that we've probably changed our
16 view on a little bit. You know, 25 years ago, we
17 would have said at least 60 percent, or 50 percent, of
18 the sites were "hard rock". Our definition of what
19 was hard rock at that time was somewhat more
20 permissive, I guess. At this point in time, given the
21 fact that we indicate about 9000 feet per second, more
22 or less, 2.8 kilometers per second, as being "hard
23 rock" in the Central and Eastern U.S., is probably no
24 more than about 30 percent, or so, of the sites.

25 So something like 60, 70 percent, roughly,

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1 will have to do some sort of site response evaluation.

2 MEMBER STETKAR: Thanks. I just wanted
3 the members to, you know, why are we focusing on this
4 part.

5 MR. CHOKSHI: And I will discuss that
6 issue further from the engineering point of view, but
7 it does make a difference in what we do the analysis,
8 and there is one of the area, in the risk evaluation
9 also comes up.

10 MEMBER BROWN: So hard rock is
11 characterized by the velocity with which the seismic
12 wave propagates?

13 MR. CHOKSHI: Yes.

14 MR. AKE: That's correct, yes. That is
15 the definition. You could think of it as either the
16 shear wave velocity or the shear modulation --

17 MEMBER BROWN: So granite is not
18 necessarily hard rock.

19 MR. AKE: Generally, unless it's highly
20 weathered, granite would be considered hard rock, yes.

21 MEMBER BROWN: All right.

22 MEMBER SKILLMAN: So, Jon, you said 25
23 years ago you would have given one answer and here we
24 are, 25 years later, you have another answer. What
25 changed?

1 MR. AKE: The recognition that, in that,
2 sort of, grey area, I know we probably don't have
3 great context for this, but typically in the past, we
4 would have used a value something like 6000 feet per
5 second for hard rock, and recognizing that, if you
6 have a, you know, few tens of meters, or a little bit
7 more, of 6000 feet per second over 9000 feet per
8 second, in frequencies of engineering interest to us,
9 you will have amplification, and we were not
10 accounting for that previously.

11 MEMBER CORRADINI: Since you answered his
12 question so quantitatively, when you say
13 amplification, the energy that's being transmitted
14 doesn't change, but its spectrum changes, right?
15 Unless there's geometric focusing.

16 MR. AKE: Right. Basically, to preserve
17 the energy in that, you're changing the amplitudes of
18 the waves.

19 MEMBER CORRADINI: So the spectrum is
20 wiggling this way and then I pass through this multi-
21 component thing and the spectrum changes, but the
22 energy is not dissipated nor increased.

23 MR. AKE: Over distances like that,
24 there's really not much energy dissipation, no.

25 MEMBER CORRADINI: It's just a matter of

1 how it changes.

2 MR. AKE: Right.

3 MR. MUNSON: And we have an example of
4 what that looks like.

5 MEMBER CORRADINI: That's fine. I just
6 wanted to make sure I understood it.

7 MEMBER STETKAR: I'm sorry I asked.

8 MR. AKE: The other thing that we have to
9 point out here too, and we'll get to in just a little
10 bit more in some detail in a moment, clearly, you
11 know, the time frame over which the operating reactors
12 were licensed span decades and the amount of
13 information on these particular items, sub-bullets,
14 that we've identified that we need for each site
15 there, the amount of information available varies
16 quite a bit across the operating reactor fleet.

17 There's more information available at some
18 of the sites than others, but the investigations that
19 were conducted at these sites represented state-of-
20 the-practice at the time they were licensed, however,
21 we do more detailed investigations today than we did,
22 you know, 25 or 35 years ago. So that does play into
23 this a little bit.

24 Recognizing that there is that variability
25 in the amount of information that's available at all

1 the sites, Appendix B of the SPID outlines a process
2 to try and estimate the site response amplification as
3 robustly as possible, including the effect of those
4 uncertainties. Clearly, at those sites that have less
5 available information in terms of site
6 characterization, there's a higher degree of
7 uncertainty associated with the site response
8 evaluation. That has to be propagated through the
9 process. Next slide, please.

10 And with that in mind, this is, actually,
11 a flowchart from Appendix B of the SPID that
12 illustrates the general approach that's being taken in
13 the process. I won't walk you through all of this.
14 I will just point out a couple of key elements there,
15 that there are differences in estimating the so-called
16 shear wave velocity profile, or base shear wave
17 velocity profile, and the large number of simulations
18 that are required to go through and perform a site
19 response analysis like this, this would be, sort of,
20 the end member of the maximum amount of uncertainty
21 that would be included in the process.

22 Not all the sites would have to do this
23 much detail, because in some cases, that middle of the
24 flowchart there, it says depth to bedrock, in some
25 cases, we know the depth to bedrock very well, within

1 just a few feet, so there would not be an uncertainty
2 that we would be assigning to that to produce
3 different cases that we would run independently and
4 try and capture that uncertainty.

5 In all cases, we'll probably generate a
6 large number of random profiles once we have
7 established a base profile for a particular site, and
8 we try to do that to represent the variability that is
9 likely to occur at the scale of a reactor footprint.
10 In other words, there is some variability at that
11 scale that we have to capture as well.

12 CHAIRMAN SCHULTZ: Jon, what's behind the
13 magic number 30 in terms of the number of profiles
14 that are developed and analyzed?

15 MR. AKE: Good question. That is what we
16 feel is probably about the minimum number that we need
17 to go through, and generate, and analyze to get a
18 stable estimate of the median site amplification as
19 well as the standard deviation.

20 MEMBER CORRADINI: So this is like a Monte
21 Carlo sampling and that's the minimum sample set?

22 MR. AKE: Right, to get a stable estimate
23 of the median and standard deviation, because I'll
24 show you in slide in a moment how we end up using that
25 standard deviation and how that impacts, ultimately,

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1 the answer we're going to get at the end of this. Was
2 I going to say something else about this? Oh, well,
3 it'll come back to me at an equally random time.

4 Yes, I think we can move on. Not all
5 sites will have to do this. Oh, I know what it was.
6 It was your question, Mike. We're not doing this in
7 Monte Carlo. This is actually being done brute force,
8 so we're actually going through every branch of the
9 tree and calculating this, and then going through and
10 --

11 MEMBER CORRADINI: So that means there are
12 30 branches?

13 MR. AKE: There is a 1000 branches.

14 MEMBER CORRADINI: So then, you collapse
15 them and take a representative bundle?

16 MR. AKE: No, from that, we calculate a
17 median site amplification function as well as a
18 standard deviation for the site amplification
19 function.

20 MEMBER CORRADINI: Oh, okay.

21 MR. AKE: And we repeat this at a large
22 number of different input amplitude levels as well.

23 MEMBER CORRADINI: Okay, then I
24 misinterpreted. You can keep on going on. I
25 understand what you said, kind of, but you lost me

1 because I was under the impression you would sample
2 through this, but you're saying you sample all the
3 branches.

4 MR. AKE: Yes.

5 MEMBER CORRADINI: Then how do you go from
6 thousands to -- that's what I'm still not --

7 MR. AKE: You will produce an
8 amplification function, you will produce thousands of
9 those.

10 MEMBER CORRADINI: Right.

11 MR. AKE: And of those, you will be able
12 to then determine what is the median and the standard
13 deviation.

14 MEMBER CORRADINI: Okay.

15 MR. AKE: And that's what we'll end up
16 using, subsequently, in our calculations.

17 MEMBER BLEY: You could actually say
18 they'd calculate the whole probably family. It's a
19 whole distribution. They can pick parameters off of
20 it.

21 MR. CHOKSHI: We do the statistics on the
22 research.

23 MEMBER CORRADINI: Okay. I think I got
24 it. There's no point in trying to educate me.
25 Dennis, he'll tell me later.

1 MR. AKE: Actually, it may become clearer
2 if we go to the next slide. Yes. This is an example
3 of three amplification functions. So if you think
4 back to that flowchart we had there a moment ago, the
5 figure on the left would be a representation of, the
6 dark line is the median, log median, and the dashed
7 line is plus one standard deviation. That's what the
8 amplification function looks like for a particular
9 site for a particular input amplitude level.

10 MEMBER CORRADINI: So given an earthquake,
11 given a seismic source, given a ground motion
12 calculation, given a site amplification watchahoozy,
13 this is what you'd show to the plant that has to meet,
14 and you'd sample this 30 times.

15 MR. AKE: No. Actually, this is the
16 result of all of those.

17 MEMBER CORRADINI: Right. But this is
18 what you hand to the plant to look at its built
19 response to it.

20 MR. AKE: Not exactly. I'll show you that
21 in just a moment, though.

22 MEMBER CORRADINI: Okay. We're getting
23 closer, though.

24 MR. AKE: Yes. We're edging ever so
25 slowly.

1 MEMBER CORRADINI: Thank you. That's
2 fine.

3 MR. AKE: This is what an amplification,
4 the lower left-hand corner there, would look like. If
5 you just look at the dark line, that would be an
6 example of a single amplification function. And what
7 you can visualize is, there would actually be
8 approximately a 1080 of those on that plot of slightly
9 different amplitudes and slightly different shapes,
10 okay?

11 And from those, at each of these different
12 frequency levels here, you could determine what is a
13 median and standard deviation, and really, connecting
14 those dots is what you see there as the median.

15 MR. MUNSON: So the amplification is a
16 function of the frequency content of the upcoming
17 wave, so if you look at the frequency, say, at 1 Hz,
18 you have an amplification that's close to 2, maybe, or
19 so, or actually, yes, close to 2, in the 10 to the
20 minus 4 kind of range, so that's how you, kind of,
21 look at the amplification.

22 MEMBER CORRADINI: And the 10 to the minus
23 4, again, you said it, and I'm sorry, I don't remember
24 what that is.

25 MR. AKE: It's basically, you can express

1 the input amplitude level in terms of an absolute
2 amplitude level or in terms of an annual frequency of
3 exceedance, and that's approximately the annual
4 frequency of exceedance.

5 MEMBER CORRADINI: Oh, okay. So this is
6 the seismic source and it's expecting --

7 MR. AKE: And the ground motion
8 propagation, yes, all rolled together to give you
9 that.

10 MEMBER CORRADINI: Got it.

11 MR. AKE: And the point I'd like to make
12 here, that the Appendix B focuses very heavily on
13 trying to capture those uncertainties inside
14 amplification. And as I alluded to a moment ago, it's
15 a function of the amount of information we have
16 available at each of the sites, as well as the
17 amplitude of the input motions, and that's the point
18 I wanted to make with the three pictures at the
19 bottom.

20 Notice that there are slight changes in
21 that median amplification function, the dark line, as
22 you move from 10 to the minus 4 to 10 to the minus 6,
23 but notice, especially, how the plus one standard
24 deviation, how much larger the uncertainty is as you
25 move to higher and higher input amplitude levels;

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1 moving from left to right here is moving from lower to
2 higher input amplitude levels that you're putting into
3 the base of the soils, and that does effect the
4 answer, as we'll show in just a moment here.

5 Any other questions? We can move on to
6 the next slide then. And how that gets translated,
7 then, into what we're ultimately going to handoff to
8 the engineers to say, okay, this is what you need to
9 evaluate the plant for, is the following. All right.
10 Keep in mind that what we said a moment ago, that the
11 source characterization and ground motion
12 characterization are used to develop an estimate of
13 the rock hazard at each individual site.

14 And in this particular case, I've shown by
15 the solid black line on this figure. And if you then
16 look at the effect of incorporating what we really
17 though is not -- for a reactor that's sited on a soil,
18 what we don't want, we don't want that rock. What we
19 really want is what the soil hazard is. What's the
20 hazard at the top of the soil column that the reactor
21 actually sits on? And that's indicated by the dashed
22 lines to the right.

23 And in the example that we showed before,
24 what you'll end up getting is something like the
25 dashed red line there to the right. Incorporating

1 these uncertainties tends to increase the hazard, in
2 other words, increase the expected ground motions for
3 a particular annual exceedance frequency, and that's
4 what almost, universally, happens.

5 MEMBER CORRADINI: So magic appears
6 between the three curves here and here, and the magic
7 is, you're somehow taking the frequency, the amplitude
8 spectrum, and then rolling it up into -- so any one of
9 these Gs, actually, is a distribution function.

10 MR. AKE: Yes.

11 MEMBER CORRADINI: Okay. That's all I was
12 trying to get at.

13 MR. MUNSON: So this is for a particular
14 1 Hz input motion.

15 MEMBER CORRADINI: Well, I mean, just to
16 pick a point, in the previous graph, you don't have to
17 go back, you have 10 to the minus 4, 10 to the minus
18 5, 10 to the minus 6, so that's an exceedance, that
19 exceedance probability, that essentially, anchors you
20 somewhere on the y-axis, and then a spectrum,
21 essentially, is built into the either the red dash or
22 the blue dash.

23 MR. AKE: That's correct.

24 MEMBER CORRADINI: Okay. This is the
25 mean.

1 MEMBER CORRADINI: This is not the one
2 signal.

3 MR. AKE: Yes. This is just the mean
4 hazard.

5 MEMBER CORRADINI: Got it. Thank you.
6 And just for the sake, I'll forget it, of
7 completeness, let's say we take the red with the with
8 epistemic. How is the amplitude frequency boiled down
9 to one point there? Is it just a simple protocol of
10 some sort of integrated averaging?

11 MR. MUNSON: So I'm going to show you
12 plots of, actually, the seismic response spectra that
13 they used to compare to the design basis of the plant,
14 but basically, what you would do is, we're concerned
15 most between 10 to the minus 4 and 10 to the minus 5.
16 So you would go over to those levels, and for 1 Hz,
17 you would go down and say it would be, like, for this
18 example, it's 3G, or actually, 2-1/2G, on the red
19 curve, you would come down, and then that would be one
20 value on your seismic response vector that I'll show
21 you.

22 → MR. AKE: Any other questions on this
23 before we move on? When the SPID was being evaluated
24 for concurrence by the NRC staff, there was a non-
25 concurrence issued on this particular document. And

1 there were three basic issues that were identified in
2 the non-concurrence for this. I'm going to try and
3 summarize each one of those here. They're the high-
4 level bullets here.

5 And then what the staff's conclusions
6 about those non-concurrence issues are indicated with
7 the carrots, the little carrots, in this slide. The
8 first issue is an apparent inconsistency between
9 NUREG-2115, which is the document that documents, if
10 you will, the Central and Eastern U.S. seismic source
11 characterization model, the collaborative effort
12 between DOE, NRC, and the industry that was conducted
13 to represent seismic sources in the Eastern United
14 States, and the guidance that's within the SPID
15 document.

16 Specifically, NUREG-2115 calls for
17 potential site-specific adjustments to the model to
18 apply it to a particular site. The staff concluded,
19 at this point in time, at least, that there was not a
20 basis for updating that model, and that was the reason
21 that the staff was willing to endorse the SPID. The
22 Central and Eastern U.S. seismic source
23 characterization project was extremely detailed. It's
24 very refined.

25 It is also, at the time that it was

1 conducted -- really, it's viewed as a regional model,
2 per se, but all seismic sources that were known in the
3 literature, or through word of mouth, or anything
4 else, that the team that was conducting that project
5 evaluated every seismic source that they could find in
6 the Central and Eastern United States.

7 So as far as we know at this point in
8 time, and I should say, at this point in time, there
9 are no additional seismic sources that have been left
10 out of that model, that we know of, today.

11 MR. MUNSON: Let me give you an example,
12 though, to help you. The ESPs and COLs, for example,
13 that you've seen coming in, they have used an older
14 EPRI source model that was developed in the '80s, mid-
15 '80s, and that model didn't have the latest
16 information on New Madrid, that it was a repeating
17 large magnitude source, or Charleston. We have, you
18 know, paleo information, paleoliquefaction
19 information, on that.

20 So the applicants for COLs and ESPs, they
21 took the old EPRI model and then they took the new
22 information on Charleston and New Madrid and
23 incorporated it into the older model. So the EPRI
24 model was the information from the mid-'80s, but with
25 updated information plopped into the model.

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1 NUREG-2115 envisions a similar process as
2 the CUES-SSC, this recent model, ages with time, as we
3 get new information about magnitudes and geometries of
4 sources, it envisions, also, a process where you would
5 update that source model. Our conclusion on this non-
6 concurrence issue was, this model was developed and
7 completed in 2012, and it's also very refined, so we
8 feel like it's providing the latest information and we
9 didn't believe that each of the individual licensees
10 needed to go through a process of seeing if they need
11 to update that CEUS-SSC model.

12 MEMBER CORRADINI: I don't want to spend
13 too much time, the Chairman will stop me, but I don't
14 understand non-concurrence issue. You're going to
15 have to explain a process to me. So does that mean a
16 member of staff, there was a consensus among staff
17 that this was an okay approach, but an individual, or
18 individuals, felt uncomfortable with that, and then
19 there was a resolution within staff that, given a
20 comfort level, that just stood out there because the
21 preponderance was on a different margin, is that what
22 that means?

23 MR. MUNSON: Yes.

24 MR. CHOKSHI: And, you know, the process
25 calls for a true documenting the non-concurrence

1 itself and the responses, and those are -- it's like
2 250 pages analysis, so that's all available, and I
3 believe the committee has that.

4 CHAIRMAN SCHULTZ: Yes, that's right.

5 MEMBER CORRADINI: Yes, we do, but I just
6 want to understand the process. So once the process
7 is concluded, it's simply documented and then you move
8 on. So then the point was, on the non-concurrence,
9 there was, I'll use the term minority opinion, the
10 minority opinion was, there needed to be a continual
11 refreshment of this by each site?

12 MR. MUNSON: Yes. Each site would take a
13 look at CEUS-SCC model and say, do those magnitudes
14 and source geometries make sense for my site?

15 MEMBER CORRADINI: Okay.

16 MR. MUNSON: The way they characterize the
17 sources, and our consensus was that the model is
18 refined and up to date, so that was not necessary for
19 this exercise, but a Fukushima response.

20 MEMBER CORRADINI: Okay. And then, so my
21 follow-on question is, the last thing you said, which
22 is, now it's 2012, in 2022, or '25, there is, in the
23 EPRI document, I have the EPRI document, I'm sure I
24 can find it, a methodology to incorporate new
25 information going forward though.

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1 MR. MUNSON: Right.

2 MEMBER CORRADINI: Okay. That's what I
3 thought. Okay.

4 MR. CHOKSHI: I'll talk more about that.

5 MEMBER CORRADINI: Okay. Thank you.

6 MR. AKE: So I should point out, though,
7 is, you know, at the time that that model was
8 concluded, there were new developments that had
9 occurred at the 11th hour right as the final touches
10 were being put on the documentation for that model.
11 For one, the occurrence of the earthquake in Mineral,
12 Virginia. And the team that was producing that model
13 at that time looked at that information and concluded
14 that it was generally consistent with the model as it
15 stood and there was no need to try and update the
16 model at that time.

17 The second issue that's pointed out in the
18 non-concurrence is, there are constraints outlined in
19 the SPID on source distances, in other words, how far
20 away from my site do I need to include seismic
21 sources?

22 And the SPID contains some constraints on
23 the applicable sources for use in the hazard
24 calculations themselves, specifically, you know,
25 consistent with the Appendix A 320 kilometers for so-

1 called background sources, so you have to include all
2 sources of earthquakes that arise, not from mapped
3 faults, but from so-called background, or area, source
4 zones within 320 kilometers of your site, and out to
5 a 1000 kilometers for what are referred to as large
6 repeating seismic sources.

7 The staff concluded that those distance
8 constraints do not exclude any significant seismic
9 sources and that we were comfortable with moving
10 forward with that. It's important to point out here,
11 one thing, that the exercises, as Cliff and Niles
12 pointed out here, is to try and perform an evaluation
13 in response to Fukushima Recommendation 2.1, which is
14 to evaluate the hazard at your site relative to what
15 the original design was for your plant, and that's
16 represented by something called the safe shutdown
17 earthquake, or SSC.

18 And Cliff's going to go over the screening
19 in a moment, and the screening process generally
20 relies on comparing something called the ground motion
21 response spectra, or GMRS, which is an estimate of the
22 seismic demands that we might estimate based on the
23 hazards today versus how does that compare to the
24 existing SSC of the plant? And the staff's analysis
25 looked at these questions with respect to, do sources

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1 beyond this range have, potentially, impact relative
2 to the coming up with a hazard estimate that is less
3 than the SSC, the existing SSC?

4 And we felt that we're not missing
5 anything that would challenge the SSC by sticking with
6 these general distance ranges. However, I think it's
7 important to point out, especially on these last two
8 bullets, the non-concurrence evaluation resulted in
9 modifications to the endorsement letter that the staff
10 produced for the SPID.

11 The last bullet is one that gets back to
12 the site response questions we just talked about a
13 moment ago, that no new site investigations are called
14 for in the SPID. The expectation in the SPID is that
15 licensees will use the available information to try
16 and come up, geological and geotechnical information
17 that they have at their site, as well as anything
18 that's easily available in the literature, or
19 something, or, you know, regional information, to try
20 and come up with the characteristics of the soils and
21 soft rocks beneath their site.

22 And the staff's evaluation went back and
23 looked at a lot of the existing FSARs for operating
24 reactors and concluded that there was actually a lot
25 of, a great deal of, information that was collected

1 during the initial investigations and licensing of the
2 plants, and that we were satisfied that that could be
3 used to characterize the outside site-specific hazard
4 at each operating reactor.

5 MR. MUNSON: As Jon said earlier, the SPID
6 emphasizes how we -- we have to incorporate
7 uncertainty into this process. So if we do have a
8 site where there's not as much information, we,
9 generally, will have higher uncertainty and that
10 effects the answer that you saw on the hazard curves.

11 MEMBER BROWN: When are you going to know
12 that? Which ones have uncertainty? Do you know that
13 going into this or are you going to depend on the
14 licensee to tell you that they are uncertain, which is
15 a little bit suspect?

16 MR. CHOKSHI: I think that's what the
17 Appendix B in the SPID, that talks about the process
18 for determining that.

19 MR. MUNSON: So you have that logic tree
20 that we showed you where you have different models and
21 you put different values on uncertainties, so it
22 depends on how much information is at the site. So
23 we're doing in-house, each site, just for our
24 confirmatory analysis, but the licensees will prepare
25 the site response for their site amplifications for

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1 their site as part of the hazard re-evaluation. So
2 we'll have a review period where we'll ask REIs and
3 try to resolve that.

4 → MEMBER REMPE: So it is possible you might
5 say they just don't have enough data when you get into
6 the details in your evaluation of what they provide to
7 you where they might be asked to get more data?

8 MR. MUNSON: We do not envision asking for
9 them to go out and do more soil borings, and, you
10 know, taking the rig out. I mean, the reactor
11 building exists there so it's not like you can dig
12 underneath it and find --

13 MEMBER REMPE: But you don't envision
14 there would ever be any need from what you have --

15 MR. MUNSON: Right.

16 MEMBER REMPE: In the document --

17 MR. AKE: Well, they may conclude that
18 they --

19 MEMBER REMPE: They may, but do you --

20 MR. AKE: Right. As they go through this
21 process, the impact of propagating those uncertainties
22 through the process, they may conclude that that's to
23 their benefit to go forward and do something like
24 that.

25 MEMBER REMPE: Okay. Your documentation

1 sometimes emphasizes that the SPID process is
2 conservative and I haven't heard you discuss that
3 today at all, and I just was wondering, could you
4 point to some examples of why you feel that it is
5 conservative? I saw you kind of shaking your head
6 like, no, I don't think it is conservative anymore, so
7 I was just curious.

8 MR. MUNSON: If you go back to that
9 flowchart, the one that has -- yes, that one. So this
10 is a very detailed process where we're going to look
11 at -- this is, you know, treating epistemic
12 uncertainty, modeling uncertainty, within the whole
13 site response process. And we're looking at three
14 different soil profiles, velocity profiles, so we have
15 a base profile, but then we're going to have an upper
16 profile and a lower profile, and randomize 30 profiles
17 about that.

18 So we have aleatory uncertainty about the
19 epistemic uncertainty. So this is, generally, for ESP
20 or COL, they'll have one base case and randomize 30
21 about it, or 60. Here, we're doing three base cases,
22 we're considering, you know, the potential to have
23 different depth to bedrock, the potential to have two
24 different non-linear models for the soil behavior, so,
25 you know, we're capturing, generally, more uncertainty

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1 than what's done for ESPs and COLs.

2 MEMBER REMPE: So it's a guess estimate,
3 sensitivity studies, I don't see anything that's
4 conservative.

5 MEMBER STETKAR: That's not conservative.
6 That's a better characterization of the uncertainty.

7 MR. MUNSON: Yes, that's why we hesitate
8 to say conservative.

9 MEMBER STETKAR: It's more realistic in a
10 sense.

11 MEMBER REMPE: Right.

12 MR. AKE: We are not trying to be
13 conservative. We're not trying to make a biases
14 estimate. We're trying to make our best estimate and
15 attempt to formally propagate the uncertainties and
16 let them inform the answer to the maximum extent
17 practical.

18 MEMBER STETKAR: It's my impression that
19 the seismic hazard part of the SPID, what we've been
20 discussing here, is a realistic characterization of
21 the uncertainties given the available information.
22 The best you can do.

23 MEMBER REMPE: But the endorsement letter
24 talks about how the --

25 MEMBER STETKAR: I think that the entire

1 SPID, which includes the guesses about fragilities and
2 the way you treat implant response to the
3 acceleration, people would claim as conservative.

4 MEMBER REMPE: Okay.

5 MEMBER SHACK: But specifically, I think,
6 for example, the endorsement letter suggests that the
7 1000 kilometers for the large sources is a
8 conservative number. I think that's -- you know,
9 there's an occasional word, conservative, hidden in
10 here, but certainly, the emphasis is on characterizing
11 the distribution.

12 MR. MUNSON: So if I have a site in
13 Florida, do I need to capture New Madrid?

14 MEMBER SHACK: That was where the
15 conservative word came.

16 MR. MUNSON: That's what we meant by
17 conservative.

18 MR. CHOKSHI: That's a good point.

19 MEMBER BLEY: Well, and they toss it in,
20 things like that, but it's really about the best you
21 can do as far as I can tell.

22 CHAIRMAN SCHULTZ: Systematically
23 characterizing the uncertainty in a more robust way is
24 going to have an effect on the results. It's likely
25 that it's going to become more conservative for at

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1 least some sites, especially those sites which have
2 changed in their characteristics over the last 20
3 years.

4 MEMBER STETKAR: Just for the record, I
5 would say it's likely to become more realistic for
6 those sites.

7 CHAIRMAN SCHULTZ: That is right.

8 MEMBER STETKAR: Worse than the previous
9 optimistic estimate.

10 CHAIRMAN SCHULTZ: That's correct. That's
11 what I was trying to say. Thank you for the
12 correction.

13 MR. CHOKSHI: And one thing the other way
14 is the added value versus the balance of time and
15 resources, and everything else, and what is more
16 important, get to the plant, because I think from all
17 that, this is, I think, you know, the right place to
18 be. And as you said, the site or licensee may decide
19 by themselves that they want to reuse those, you know,
20 uncertainties and do more realistic.

21 MR. AKE: I guess just to summarize on the
22 non-concurrence too, that the evaluation of the non-
23 concurrence issues by staff did result in several
24 changes to the endorsement letter that we felt were
25 justified.

1 MR. CHOKSHI: And add more clarification
2 on some of the issues.

3 CHAIRMAN SCHULTZ: The committee
4 appreciates that. We've reviewed that carefully also
5 and we've seen that as a result.

6 MR. AKE: Do we have any other questions
7 on --

8 MR. MUNSON: This is a good summary slide
9 for the hazard part.

10 MR. AKE: To summarize, the probabilistic
11 seismic hazard analysis for what we refer to as the
12 ground motion response spectra, or GMRS, which is what
13 Cliff is going to talk about next, spend the next
14 little bit of time talking about, really, is broken
15 down into these three pieces; the seismic source
16 characterization, ground motion model, and ultimately,
17 then, deriving seismic hazard curves for rock.

18 And, you know, we've discussed how the
19 Eastern U.S. is being done a little bit differently
20 for seismic sources and ground motions than the
21 Western United States plants. The approach is
22 somewhat slightly different. And then for those sites
23 that are on rock, you know, the green box is where we
24 end up, and those are the rock hazard curves. And for
25 those sites that are on soil, or soft rock, we have to

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1 go through the site response to come up with the
2 ground motion response spectra, or GMRS.

3 And Cliff's going to go over how we --

4 MR. MUNSON: Can you go to the next slide?
5 So what do these curves look like? These are plots of
6 seismic response spectra. So we take those hazard
7 curves, and basically, we look in the 10 to the minus
8 4 to 10 to the minus 5 range and we compute what we
9 call GMRS, ground motion response spectra, and those
10 are the red curves in each of these figures. And then
11 we take those GMRS and compare them to the site SSC,
12 which was determined in a deterministic fashion back
13 in the '70s looking at, like, a maximum-type scenario.

14 So in the first box in the upper right-
15 hand corner is a scenario where the GMRS is computed
16 and it's enveloped by the SSC for the site. In that
17 case, the licensee would screen out of having to do
18 any further analysis. We go down to the bottom, in
19 the left-hand corner, this is what, actually, a hard
20 rock site looks like. You get a GMRS that's amplified
21 in the higher frequency range, so this one has a peak
22 at around 25 to 30 Hz.

23 And so the GMRS does exceed the SSC for
24 this case, but what we're interested in for the plant
25 structures and systems is mainly in the 1 to 10 Hz

1 range, and that's where the natural frequencies are
2 for most of the system structures and components.

3 So our comparison between a GMRS and SSC
4 is focused between 1 and 10 Hz, so in this case, where
5 the exceedance is above 10 Hz, this licensee would not
6 need to do further risk evaluation, but instead, would
7 rely on a testing program for high frequency sensitive
8 components, which EPRI is conducting right now, and
9 which Nilesh will talk much more about.

10 So for this scenario, we would look at
11 electrical relays, and switches, and things that are
12 sensitive to this high-frequency chatter that could
13 chatter at high-frequency ground motions.

14 MEMBER CORRADINI: So just from an
15 empirical standpoint, everything you just said, then,
16 is consistent with what occurred at North Anna, right?
17 If I remember correctly, when the utility came in to
18 give us their, kind of, post mortem, their redline,
19 from what they experienced, was only exceeding the
20 equivalent grey line at high frequency and only a
21 small amount?

22 MR. MUNSON: Actually, there's two
23 problems. These are free-field motions. Okay. So
24 these represent motions in the free field away from
25 structures. Okay. At North Anna, we didn't have free

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1 field recordings of the earthquake. We had recordings
2 of the earthquake within the structure itself, at the
3 base mat, at the top of containment. So you have the
4 structural motions that are influencing the ground
5 motion that came in.

6 So they weren't able to make a direct
7 comparison between the SSC, which is free-field
8 motion, and the motion they actually recorded in the
9 plant. However, the exceedances, they did actually
10 have exceedances between 1 and 10 Hz. They did have
11 exceedances that were, they're not huge, but at the
12 base mat level, they weren't huge.

13 But they did have exceedances, so they did
14 do, you know, the thorough walk-downs of all the plant
15 systems, structures, and pods.

16 MEMBER CORRADINI: Okay.

17 MR. MUNSON: So there were exceedances
18 between 1 and 10 Hz.

19 MEMBER CORRADINI: Okay. All right. I
20 guess I forgot about that. Well, that's enough. I
21 don't want to keep this going. I'm sorry.

22 → MEMBER SKILLMAN: Cliff, let me ask this
23 question, please. You mentioned that the frequency of
24 interest is between 1 and 10 Hz. I spent years in
25 Germany at the Bundesrepublik GSK, the Sicherheits

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1 Commission required 3 to 30 Hz and we spent an immense
2 amount of effort demonstrating compliance, seismic
3 robustness, in the 3 to 30 Hz. You mentioned 1 to 10.
4 Why 1 to 10? And I have a second question that's
5 built on that, how is this being applied to a Part 52
6 license so that new builds don't end up in your upper
7 right-hand corner where the GMRS vastly exceeds the
8 SSC?

9 MR. MUNSON: Okay. Let me start with the
10 second question and then I'll answer the first one.
11 My structural engineer to the left here can do the
12 first question. So for new reactor situation, Part
13 52, each design, AP1000, EPWR, they have what are
14 called certified seismic design response vectorum.
15 Those are anchored at 0.3G. They have similar shapes
16 to the SSC you see on the pictures there. Basically,
17 the one in the upper right-hand corner is probably the
18 best example, but they're elevated up to 0.3G.

19 So the anchor point is 0.3G and the whole
20 spectrum is elevated. Okay. So those are the designs
21 for the AP1000. They show that they meet those
22 designs in the certification of the AP1000, or EPWR,
23 or whatever. So then we do calculate a GMRS, or
24 applicants calculate a GMRS, as part of their ESP
25 application or COL application, they compare that GMRS

1 to the CSDRS for the site, if there are exceedances,
2 then they have to go do more soil structure
3 interaction, more detailed analysis, to demonstrate
4 that the plant design can handle this GMRS, so there's
5 more detailed analysis.

6 MEMBER SKILLMAN: Got it on 52, now let's
7 talk about 3 to 30 versus 1 to 10.

8 MR. CHOKSHI: Yes, I think because most of
9 the plant structures and the components of interest in
10 the nuclear plant, they have fundamental frequencies
11 between 1 to 10 Hz, most of them, and so from the past
12 studies, we have seen that that part of the spectrum
13 is very important, because that's where you find the
14 least contributors, so that's the focus. Now, the
15 high frequency part, primarily, it effects the
16 electrical contacts, and relays, and things, and so we
17 are dealing that in a separate fashion, and I will
18 talk about that more.

19 But to just mention about the screening,
20 we are using 1 to 10. As you do plant evaluations,
21 then you look at the, you know, whole spectra, which
22 is used in the response evaluation. So from the
23 screening perspective, I think 1 to 10 Hz is very
24 important, and you will see that when I talk about
25 this. A number of criteria on the risk evaluation are

1 dependent on that, you know, factor.

2 MEMBER SKILLMAN: Okay. Thank you.

3 MR. MUNSON: So in the upper right-hand
4 corner we have a scenario where the GMRS exceeds the
5 plant safe shutdown earthquake response vectorum
6 between 1 and 10 Hz, you know, in several places. And
7 so that plant would need to do a seismic PRA, in this
8 case, seismic probabilistic risk assessment. So I
9 have more information on that.

10 MR. WIDMAYER: Hey, Cliff? On that
11 Outcome 3. Yes. Do they also have to do the industry
12 testing programs since they had exceedances?

13 MR. MUNSON: Yes.

14 MR. WIDMAYER: Okay. So they do the whole
15 nine yards.

16 MR. MUNSON: Yes.

17 MR. WIDMAYER: Okay.

18 → MR. MUNSON: Okay. So an additional
19 factor is, we bring in the IPEEE analysis that was
20 done. So this isn't the first time we've looked at
21 seismic ruggedness of plants. We had the SEP program
22 in the '70s, we had USIA46 program, and then the
23 IPEEEs in the '90s, and so plants have done walk-
24 downs. Many of the plants have done either margins
25 assessments or seismic PRAs as part of the IPEEE.

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1 So licensees are able to use their IPEEE
2 results in certain cases. Now, just to talk about the
3 picture first. This picture shows, the dashed line is
4 what we would call the IPEEE spectrum. So that's the
5 review level earthquake spectrum for this plant and
6 it's anchored at the actual HCLPH that the plant
7 demonstrated, for this case, in an SMA that they did.

8 So this plant was able to demonstrate a
9 plant HCLPF of 0.3G, and so in this case though, the
10 IPEEE spectrum doesn't help them because the GMRS
11 exceeds that also, so for this example. So which
12 plants can use IPEEE results? The plants that did
13 SPRAs or the plants that did full or focused scope
14 SMAs. Plants that did reduced scope SMAs cannot make
15 use of the IPEEE results for the Fukushima response.

16 An additional requirement is plants that
17 did the focus scope need to enhance that to make it
18 the full scope SMA. The requirements, they need to
19 demonstrate that the IPEEE commitments were carried
20 out, the commitments resulted from the IPEEE analysis,
21 that any modifications were completed and are still in
22 effect today, that they took care of any deficiencies
23 that were pointed out in the safety evaluation that
24 the staff prepared.

25 And then they need to show the adequacy in

1 a written evaluation of the structural models,
2 selection of equipment, screening, walk-down, peer
3 review, the fragility system modeling, there's other
4 elements, but they need to go through and demonstrate
5 that those particular aspects are still relevant for
6 the hazard that we re-evaluated for today in the form
7 of the GMRS.

8 So that's the exercise that they would go
9 through to make use of the IPEEE results. When we say
10 make use of the IPEEE results, that's using a
11 slightly, in most cases, higher spectrum for the
12 screening evaluation.

13 MEMBER STETKAR: Cliff?

14 MR. MUNSON: Yes.

15 MEMBER STETKAR: Let me ask a couple
16 questions about this use of the IPEEE stuff. In the
17 endorsement letter, it talks about what you just
18 summarized and there's a statement that says, "As
19 such, even if one or more of the criteria are not
20 deemed to be adequate, the staff may still decide that
21 the overall IPEEE analysis is adequate." You know,
22 that addresses the sub-bullets down there on the
23 right-hand side of your slide.

24 That, to me, interjects some degree of
25 subjectivity and uncertainty into this process, how

1 are you going to determine whether they're adequate
2 and how do you determine that mine is adequate even
3 though I didn't do a walk-down, and somebody else's is
4 inadequate because they did a walk-down, but they
5 didn't look at enough things? For example, that
6 qualification in the endorsement letter really --

7 MR. CHOKSHI: Yes, I think the reason for
8 the qualification was, and you picked on one of the
9 key elements, if the walk-downs were done, not
10 properly, I think the, you know, decision would be
11 swayed considerably by that, but there might be a
12 question that the models, for example, maybe not the
13 best models, but if he got that means that it gives me
14 the lower bound on the capacity so it's adequate for
15 the screening.

16 So we want to leave that room for that
17 kind of judgment because, you know, again, overall,
18 this is subjective because, you know, there are going
19 to be some qualitative and some quantitative
20 arguments, but we didn't want to take away that
21 possibility that people can, you know, demonstrate
22 adequate for these purposes and may depend not only
23 all the factors being, you know, perfectly mentioned.
24 That was the thought.

25 MEMBER STETKAR: Are you developing

1 guidance, Nilesh, you know, if a licensee comes in and
2 says, we feel our IPEEE analyses are adequate for this
3 purpose, does that just initiate a dialog?

4 MR. CHOKSHI: Yes, we haven't thought
5 about developing the guidance, but I think this is
6 worth it, you know, and I think throughout this
7 process, the experienced reviewer and peer reviewer,
8 those elements become very important, you know? And
9 so we're going to rely on whatever. You know, that's
10 why peer review element is included in this part, you
11 know? What was the regional peer review and do we
12 have, you know, better belief, you know, or confidence
13 in what was done?

14 So it's subjective and I think it's going
15 to be relying on the experience of the, you know,
16 reviewers.

17 MEMBER STETKAR: Thanks.

18 MS. KAMMERER: Nilesh, you might also
19 mention, though, that there has been -- the original
20 peer review, but also, there's been discussion in-
21 house of having a panel, sort of, review these as a
22 group, and that will make consistency and allow for a
23 more in-depth look at the elements to say, what would
24 move the needle; what wouldn't?

25 MEMBER STETKAR: That helps me an awful

1 lot in terms of the notion of consistency. It could
2 be pretty intense, though, because, you know, you're
3 going to get a lot of these over a relatively short
4 period of time, but that would help, having a panel
5 that invokes some consistency.

6 MR. CHOKSHI: And I think one of the
7 things we emphasized in our discussions with the
8 industry on this is that, documentation of these
9 aspects, the way the base is, it's extremely critical,
10 because otherwise, you know, it will be very hard to
11 make judgment. And as Annie said, I think when all
12 people are looking at the same, you know, detailed
13 information, hopefully we will get to the same
14 conclusions.

15 MR. WIDMAYER: Hey, Nilesh, along those
16 lines, any idea how many folks will want to use the
17 IPEEE for screening?

18 MR. CHOKSHI: No, I don't have any idea
19 and I'm just looking at Kimberly or Jon, do you have
20 any idea?

21 MS. KEITHLINE: This is Kimberly Keithline
22 from NEI. We don't know the answer to that question
23 yet, you know, about who will end up -- they're all
24 reviewing right now to see what state their IPEEEs are
25 in and how much work we do. This is a, potentially,

1 huge amount of effort. So it's a judgment between
2 whether they think they're in a region where the
3 seismic hazard might increase significantly and
4 whether it might be worth spending the next year, you
5 know, doing this very intense effort or not. We don't
6 have the answer.

7 MEMBER STETKAR: One other question, and
8 perhaps for Nilesh, I'm not sure, or Cliff, you drew
9 a little line there through reduce scope and I'm not
10 sure if I understand what that means. In particular,
11 about a fairly large percentage of the IPEEE
12 submittals used the EPRI seismic margins approach. Is
13 that what you mean by reduced scope here?

14 MR. CHOKSHI: No.

15 MEMBER STETKAR: Okay.

16 MR. CHOKSHI: You know, when we did the
17 IPEEE there were three categories of planned; reduced
18 scope, focus scope, and full scope.

19 MEMBER STETKAR: Okay.

20 MR. CHOKSHI: Reduced scope where the
21 seismicity was so low that they only looked at SSC.

22 MEMBER STETKAR: Okay.

23 MR. CHOKSHI: They didn't go beyond that,
24 so this just automatically falls out.

25 MEMBER BLEY: That's what I thought.

1 MR. CHOKSHI: So that was the reduced
2 scope.

3 MEMBER STETKAR: Yes, because I'll get to
4 that on the next slide, then, if that's what that
5 means. In the sense, though, of the plants, and I
6 think I copied down some numbers here, 42 submittals,
7 62 units performed seismic margin assessments using
8 the EPRI methodology. In the draft version of JLD-
9 ISG-2012-04, it says, "The EPRI SMA method is not
10 acceptable for satisfying the objectives described in
11 the 50.54(f) letter."

12 So if I now come in with my IPEEE seismic
13 margin analysis done according to the EPRI
14 methodology, are you going to determine that's okay?

15 MR. CHOKSHI: Yes, I think if they are
16 shown that the plant capacity is sufficiently higher
17 than the GMRS, then we are going to say okay. Now,
18 you know, that ISG, going forward, for the plants
19 which have to do the evaluation, we don't want them to
20 use the success part, because the decisions which you
21 have to make in phase 2, I think they are better made
22 with the risk type of information rather than the, you
23 know, success part, so that was the thought.

24 MEMBER BROWN: I don't understand. You
25 say, in one case it's not okay to use it, in the 2012,

1 and then you said, yes, it is if they come and say
2 it's okay?

3 MR. CHOKSHI: You know, we are using
4 screening that, you know, if you know that the plant
5 has a significant higher capacity than the new ground
6 motion, we are saying that's okay if it's
7 demonstrated, so we'll use that information, you know,
8 and not require further evaluation.

9 MEMBER SHACK: So there's another
10 subjective element here is how much margin you have?

11 MR. CHOKSHI: Yes, well, the GMRS, it's
12 already, like, 10 to the minus 4, 10 to the minus 5,
13 so you know what the hazard exceedance level is. And
14 so your plant capacity is already shown to be higher
15 than that, it's sufficient. We don't say that, you
16 know, how much higher?

17 MEMBER BROWN: No, it just sounded, what
18 he said, is that, hey, we told you you can't use that,
19 but you didn't believe us, and we're going to ask you
20 to do it anyway. That's what it sounded like. And if
21 that's not the case, that's fine. I just didn't
22 understand the nuance. If everybody else understands
23 it, I quit.

24 MEMBER STETKAR: Yes, I did. Thanks.
25 That helps.

1 MR. MUNSON: Okay. So there's a couple of
2 other considerations on the screen. If the GMRS
3 exceedance is very slight over a very narrow range,
4 then a risk evaluation isn't needed. And then another
5 case on the bottom where the hazard is very low, the
6 GMRS is very low, and the exceedance is only in the
7 very lowest low, below 2-1/2 Hz, in the low frequency
8 range, for that plant, they would identify systems,
9 structures, and components, like tanks, perhaps, that
10 are susceptible to this lower frequency motion, in the
11 1 to 2 Hz range, and then they would look at the
12 capacity of those pieces of equipment relative to the
13 GMRS that they calculated and they wouldn't need to do
14 a full risk evaluation.

15 So these are two slight nuances that were
16 included in the SPID guidance so that plants wouldn't
17 have to spend the three to five years doing risk
18 evaluations for their other plants.

19 MEMBER STETKAR: Something you said, I
20 don't think I got from the SPID. You said, in that
21 lower right-hand corner, in the area where the blue is
22 above the green in the low frequency, in this
23 particular example, those plants would still need to
24 demonstrate the HCLPF capacity for structure --

25 MR. MUNSON: For components.

1 MEMBER STETKAR: -- whatever, components
2 or structures?

3 MR. MUNSON: Right, that are susceptible
4 to --

5 MEMBER STETKAR: Within that frequency.

6 MR. MUNSON: Yes.

7 MEMBER STETKAR: Okay. I didn't get that.
8 I thought they just got a get out of jail free card.

9 MR. MUNSON: No.

10 MEMBER STETKAR: Okay. I probably misread
11 something.

12 MR. CHOKSHI: And, you know, the type of
13 things which could be, like tanks --

14 MEMBER STETKAR: No, no, yes, I don't care
15 about the specific items. For some reason, I missed
16 the fact that they would still need to do some
17 evaluation in whatever frequency range where you might
18 exceed the --

19 → MEMBER SKILLMAN: I'm interested in why
20 there's a pass where the ground motion exceeds SSC,
21 even for some very limited frequencies, because it
22 could be that, at 1-1/2, 2, 3 Hz, those are your
23 component cooling water pumps, where they, certainly,
24 above 10 Hz you're getting into the relay chatter high
25 frequency stuff.

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1 MR. MUNSON: Okay. So above 10 Hz, they
2 would still have to do the high frequency evaluation
3 and demonstrate the capacity of high frequency
4 components. They don't get a pass on the high
5 frequency, but in the 1 to 10 --

6 MEMBER SKILLMAN: In the 1 to 10, it seems
7 like you're saying, hey, there are several discreet
8 frequencies where it's okay to exceed by 10 percent.
9 And it seems to me that that is an unwarranted pass
10 because it could be that the most important component
11 just has to be, just maybe resident, at that
12 particular location.

13 MR. CHOKSHI: Yes, but I think there are
14 two caps; one is on the amount of exceedance. It's
15 like 10 percent. So you can't exceed by very, you
16 know, huge, you know, did you get a sharp peak? You
17 know, it's limited by that. And second is number of
18 frequencies you can exceed is limited. So there is a
19 dual criteria there in order to meet this requirement.
20 So when you look at that, the overall effect of the
21 spectrum is no different than what you -- you know,
22 they are not that different when you apply both the
23 criteria.

24 MS. KAMMERER: I mean, I think it's worth
25 mentioning, too, that 10 percent exceedance, you have

1 to remember, these components have margin in them
2 which should well exceed that, you know, when you're
3 starting to get to the beginning of inelastic
4 deformation. It doesn't mean failure of the
5 component, so there should be margin enough in this
6 particular component so that a 10 percent exceedance
7 above design should still -- we should still have
8 confidence in its performance.

9 MEMBER ARMIJO: But why 10 percent? Why
10 not 15 percent, or 5 percent, or 20 percent? I mean,
11 where did the 10 percent come from? Is it arbitrary?

12 MR. CHOKSHI: I think it's based on the
13 knowledge we have. You know, we know what kind of
14 margins they have, the experiences with the, you know,
15 past analysis. You know, the question, I think, is,
16 you know, this is a screen, whether to do more PRA.
17 I think we want to try to be judicious, that are we
18 making people do the effort which is not going to
19 result into, you know --

20 MEMBER ARMIJO: In any significant
21 benefit.

22 MR. CHOKSHI: Right, benefit.

23 MEMBER ARMIJO: But let's assume over the
24 whole frequency range of 1 to 10, you exceeded it 10
25 percent across the board.

1 MR. CHOKSHI: That will fail this test.

2 MEMBER ARMIJO: Why isn't the same
3 reasoning applied to components in the --

4 MR. CHOKSHI: Because then, sort of, when
5 you apply across, the overall energy level is
6 changing. You know, isolated. You know, because when
7 you talk about isolation, you got peaks and dips. So
8 overall energy level is still pretty similar, you
9 know? And as you said, at some point, you want to
10 draw a line. And so we are using this dual criteria,
11 exceedances, amount of exceedance, and the number of
12 frequencies. So we want to control that it should not
13 be uniformly higher, otherwise, you would have just
14 said 10 percent, you know, for the screening.

15 We just wanted to control that, you know,
16 the spectrum will not effect overall response of the
17 plant.

18 MEMBER SKILLMAN: Let me follow-up. What
19 you're talking about is narrow band exceedance, and I
20 recognize this is an example at 2 Hz, and maybe 7 or
21 8 Hz, it's an example, is the SPID informed as to what
22 components might be in unique frequency response
23 ranges such that you could say, hey, you really don't
24 need to do a margin analysis? In other words, it just
25 strikes me that the two, in this particular example,

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1 frequencies that you have said, hey, you don't have to
2 do anything else, may be frequencies of components
3 that are very highly important.

4 And I understand what Dr. Kammerer has
5 said, there should be margin in those components, but
6 I've been around long enough to know that sometimes
7 it's not there. And so the very components that you
8 may be depending upon that are exceeding are the ones
9 that --

10 MR. CHOKSHI: Yes, but the thing we are
11 talking about, the 10 percent higher risk ones. You
12 know, because already, you have designed a component
13 to that blue curve, and now you have a 10 percent
14 more. So, you know, we know that most of the seismic
15 designs, the design practice itself, has a tremendous
16 margin. And if I do change my fragility by that small
17 amount, would that make any difference in my PRA
18 results? I would say, no.

19 And so that's the thinking, you know, that
20 doesn't really change anything, you know, particularly
21 because you are talking about one or two components,
22 you know, not the entire plant, and that's one of the
23 reasons why not go uniform increase 10 percent.

24 MR. MUNSON: Our thinking, this is very
25 restrictive. It's 1/3 of an octave. So it's 1/6 on

1 either side of a point that has less than 10 percent
2 exceedance. So it's very restrictive exceedance; the
3 very narrow band exceedance.

4 MS. KAMMERER: I think the calculation
5 that you're suggesting to would be very hard to map
6 directly because these are ground motion inputs in the
7 free field and they don't necessarily map exactly to
8 the input --

9 MEMBER SKILLMAN: To the device.

10 MS. KAMMERER: Right.

11 MEMBER SKILLMAN: At the location.

12 MS. KAMMERER: Right. So to do that
13 generically would be challenging, I think.

14 MEMBER SKILLMAN: Well, what I was really
15 going after is, you know, it's not out of bounds a
16 little bit, it's still a home run, but it's just kind
17 of over that line by a little bit, and I think this
18 committee has a responsibility to challenge whether or
19 not even slight deviations can be significant.

20 MR. CHOKSHI: I think Jon Richards --

21 MR. RICHARDS: My name is Jon Richards
22 with EPRI. I would say that that particular criteria
23 was effectively borrowed out of the IEEE standard for
24 seismic qualification of equipment and you are allowed
25 to have a 10 percent exceedance, or a 10 percent

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1 exceedance of your required spectra, beyond your
2 capacity spectra, provided it meets these narrow band
3 exceedance criterias.

4 So if you had that kind of difference in
5 an IEEE-344 test, you'd still be able to say that that
6 item meets the qualification requirement, but it's a
7 pretty tight constraint.

8 MEMBER SKILLMAN: Thank you.

9 MR. CHOKSHI: Good. Thanks, Jon.

10 CHAIRMAN SCHULTZ: Any other questions
11 related to screening? Before we move into the next
12 section on the key SPID positions, I'd like to call
13 for a break in the discussion, and we'll return at
14 10:20.

15 (Whereupon, the foregoing matter went off
16 the record at 10:03 a.m. and went back on the record
17 at 10:21 a.m.)

18 CHAIRMAN SCHULTZ: We'll bring the meeting
19 back to the record and continue the presentation.

20 → MR. CHOKSHI: All right. Thank you, Dr.
21 Schultz, and what you heard, I think, basically, the
22 first five chapters of the SPID, Jon and Cliff, took
23 you through a lot of hazard screening, then those
24 elements, and I'm going to cover, basically, Chapter
25 6 and 7 of the SPID, dealing with the risk evaluation.

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1 And, you know, the risk evaluation has the three
2 components, maybe I should have put the slide, hazard,
3 fragility, and systems modeling. They cover the
4 hazard in detail.

5 And the Chapter 6 covers the rest of the
6 PRA elements, but primarily focusing on the fragility
7 or the response calculations and the capacity
8 calculations. There's several, I think, the focus in
9 this general. First of all, I think is to come up
10 with the positions on the issues where you want to
11 assure consistency from a licensee to licensee, so I
12 think that's one of the purpose of this thing, that,
13 sort of, people are applying the standard requirements
14 in a consistent fashion.

15 It's to assure that there is alignment on
16 how the ASME standard can be used. The second thing
17 I think is important element here is how efficiently
18 we can use the existing information and, when
19 appropriate, use, you know, the available information
20 and minimize doing a lot of new work, because to do
21 this in a reasonably timely fashion, we need to use
22 limited resources in a very effective way.

23 So I think there are a number of reasons
24 why I think it was very important, you know, when you
25 move into this part, because the total response and

1 fragility is where the, to me, real crunch comes into
2 the -- and both aspects of interpreting the
3 requirements from the standard and coming up with a
4 common implementation approaches, and second, using
5 the resources effective. So a lot of this discussion
6 centers around that.

7 If you look at that Chapter 6, it's
8 basically talking to the certain categories; response
9 categories, capacity categories, screening, and some
10 other topics, like larger release frequency and the
11 peer review, and the documentation, other parts of the
12 complete story. And then the Chapter 7 is spent,
13 which I'll cover very briefly.

14 So this first slide deals with the
15 elements of the structure of models, doing the seismic
16 responses, and the things we discussed earlier about
17 rock, and I'll discuss that a little bit more in
18 detail. So the purpose of the first position on
19 structural modeling is to make sure under what
20 conditions you can use existing models. You know,
21 what set of criteria needs to be justified and, you
22 know, the criteria is in terms of that; am I capturing
23 appropriate frequency, are the current responses
24 critical for my analysis?

25 And is the criteria is such that it

1 requires, again, the use of an experienced structural
2 engineer to make summary judgment. And when I come to
3 peer review section, it sort of demonstrates why the
4 peer review process, the way we describe, and why it's
5 an important element. The seismic response scaling is
6 another important element in terms of determining when
7 I can do this.

8 And I think some of these things, when we
9 came and talked to you about SMA, ISG, because they
10 incorporate similar positions, because this is across
11 both the matters. And again, is under what conditions
12 I can use my in-structure response spectra to scale to
13 a new demand? And there again, it depends on the
14 frequencies of interest; what were the shapes used in
15 the original?

16 This becomes critical because as Cliff
17 showed the spectra of comparisons, the new ground
18 motion model and what were used in the original design
19 differ drastically in some cases, so this is an
20 important question because that will decide whether
21 you need to do a new analysis or not. So again, this
22 is a specific criteria and people have to demonstrate
23 in order to say, yes, I can do the scaling.

24 And if you go to the SPID, it provides
25 examples under what conditions you can do and you

1 can't. Now, the third bullet is the fixed-base
2 analysis criteria. You know, as Jon mentioned that,
3 earlier, we used to think rock differently. In fact,
4 I think if you go into the older SRP, if I remember
5 right, my numbers, shear wave velocity of 3500 feet
6 per second was considered when you go to the fixed-
7 base analysis.

8 In the SPID, they talk about 5000 feet per
9 second, and they have done additional analysis, and
10 it's in Appendix C, to come up with where it's
11 appropriate to use original fixed-base analysis.
12 Fixed-base analysis you do when you have hard rock,
13 but basically, what you are saying, that I don't have
14 a soil spectra interactions because, you know, my rock
15 is very hard.

16 So under what conditions I can use that.
17 They have done some supporting analysis, and again,
18 the criteria are specified. So those are the primary
19 positions associated with dealing with the calculation
20 of responses involving structures and soil/structure
21 interaction.

22 The next position deals with doing the
23 fragility and capacity calculations. You know, the
24 way we do fragility, it incorporates both the
25 responses and the capacity, so now there's a second

1 part of the fragility. And I think we had an
2 extensive discussion. I remember --

3 MEMBER STETKAR: We did, but I need to get
4 something else on the record, so I'll let you go
5 through the slide.

6 MR. CHOKSHI: So now, again, I think there
7 is a discussion and then in Appendix D, I think there
8 is additional, you know, just provided the basis for
9 this, but what this position does, it allows the use
10 of hybrid approaches where you can use conservative
11 deterministic failure margin analysis because more
12 people can do that, it's very prescribed, it requires
13 less judgment, and again, it identifies conditions,
14 how you will use it and what are the uncertainty
15 parameters you will use? That's where the table is.

16 But I think also, in addition to that, use
17 of that, there is also a requirement that at the end
18 of the analysis, you will take the dominant risk
19 contributors and do a separation of variable or
20 traditional fragility analysis. So, you know, where
21 this SPID has come from, I think --

22 MEMBER STETKAR: Okay. Let me quickly --

23 MR. CHOKSHI: Okay.

24 MEMBER STETKAR: This, again, it's
25 supposed to be a, whatever it's called, conservative

1 deterministic --

2 MR. CHOKSHI: Failure margins.

3 MEMBER STETKAR: -- failure margins
4 analysis. The key being, conservative and the purpose
5 is to identify SSCs for which you may need to do a
6 more detailed analysis. So we want to be pretty sure
7 that it is, indeed, conservative. The process is such
8 that the larger beta-C you apply, the less
9 conservative it is. And in fact, it can be optimistic
10 because the median capacity becomes higher and higher,
11 as you've shown here by this multiplier, although,
12 it's difficult for people to see exactly what that
13 means.

14 So my fundamental question is, and I've
15 looked at a lot things, there are statements in the
16 SPID that says it's very unusual to have beta-Cs less
17 than about 0.3, which indeed, in practice, is really
18 true. Why don't you just say, use, for CDFM, beta-3
19 for everything? That will be conservative. It's not
20 unrealistic. It's not beta-C equals 0.1, which is,
21 you know, contrary to actual experience, but a beta-C
22 of 0.3 for everything will certainly give you
23 realistic to conservative estimates and would tend to
24 highlight areas better, perhaps, where you need to do
25 more detailed analysis.

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1 Rather than this structured approach for,
2 pick one from Column A and use this, pick one from
3 Column B and use this other one, and so forth, that's,
4 to me, a bit troublesome.

5 MR. CHOKSHI: I think you are right.

6 MEMBER STETKAR: I don't know how much
7 difference it would make, but I know that using too
8 large a beta-C could give you optimism. That's the
9 troubling part.

10 MR. CHOKSHI: Yes, particularly if your
11 starting point is the 1 percent.

12 MEMBER STETKAR: Particularly if your
13 starting point is the 1 percent.

14 MR. CHOKSHI: Right, because that is going
15 to shift the median further out.

16 MEMBER STETKAR: Yes, you will.

17 MR. CHOKSHI: Yes. But I think this was
18 based on the experiences that, you know, as you say,
19 the random part, which primarily comes from the ground
20 motion, remains constant for everything. It's the
21 other part which is reflecting the beta-You part, and
22 I think, to me, this tried to capture the differences
23 between the structures and components, you know, as we
24 have learned from the past experiences.

25 But I think, you know, you are right, it's

1 for certain that if I use beta-C of 0.3, I'm going to
2 be conservative.

3 MEMBER STETKAR: Right. And again, the
4 point of this is not to do a detailed analysis, it's
5 to, as you said, highlight items, because you're going
6 to run these capacities through a model and determine
7 what are, ostensibly, at least, at your first cut,
8 potentially important risk-sensitive SSCs for which
9 you may to do more detailed analysis. You know, there
10 are statements in the SPID that says, well, the
11 results are relatively insensitive to beta-C. I'm
12 sure that smart people wrote those sentences.

13 If that's true and they're relatively
14 insensitive, then use a small value for beta-C because
15 the implication of that statement is that it won't
16 effect your results very much.

17 MR. CHOKSHI: And as you said, the
18 Appendix D, that's coming from Bob Kennedy's, I think,
19 1999 paper, but exactly, I think the point here is
20 made that, if I vary beta from 0.3 to 0.6, what I get
21 into the overall results is not that significant.

22 MEMBER STETKAR: Well, I'm sorry, 0.3 to
23 0.6 makes a factor of 2 difference in the median.

24 MR. CHOKSHI: Yes.

25 MEMBER STETKAR: And a factor of 2 can be

1 pretty large, depending on the shape of your hazard
2 curve, in terms of frequencies of failures.

3 MR. CHOKSHI: Yes, you know, but we have
4 had a lot of discussion with this. But I don't think
5 in the identification of dominant risk contributors
6 it's going to be that, you know --

7 MEMBER STETKAR: I don't know.

8 MR. CHOKSHI: I think what we will see and
9 I think, you know, but I definitely do agree that 0.3
10 would definitely tell if it's conservative.

11 MEMBER STETKAR: Okay.

12 MEMBER CORRADINI: Can I ask a different
13 question? So just to follow Jon. So do you have a
14 justification to make it larger than 0.3? That's
15 another way of asking it.

16 MEMBER BLEY: My kind of the thing that's
17 going on here is, usually, if you overestimate your
18 uncertainty, usually, it's in the conservative
19 direction. The trouble is, in this case, they're
20 taking this thing, which, if it were centered where it
21 belongs, would do that, but they're anchoring it in an
22 artificial point, which shoves the whole thing out to
23 the side.

24 MEMBER STETKAR: The normal process is to
25 estimate a median acceleration on uncertainty, and

1 then the larger uncertainty, indeed, accomplishes a
2 conservative estimate because it pushes the lower
3 bound of the capacity down to lower accelerations.
4 Here, they're fixing the lower bound and assigning and
5 uncertainty to stretch the upper end up.

6 MR. CHOKSHI: Yes, that's the reason for
7 the check, because in the end, you want to do estimate
8 median first and then see whether you are winding up
9 in the right place.

10 MEMBER CORRADINI: Thank you.

11 MR. CHOKSHI: Okay. Can we go to -- now,
12 we talked about the high frequency, you know, that,
13 and I think Cliff mentioned that the way we are
14 dealing with high frequency, the industry proposal is
15 to deal with it by doing tests, and I think, to me,
16 that's an important step forward because our
17 traditional approach has relied on combination of
18 things, doing circuit analysis for that sort of thing,
19 and some --

20 → MEMBER BLEY: It's fairly important, I
21 think, and this came out real strongly, I think,
22 during the North Anna discussions around here, the
23 tests, compared to most earthquakes, are kind of
24 extreme in the time duration.

25 MR. CHOKSHI: Exactly right. Yes.

1 MEMBER BLEY: Which means you're putting
2 a lot more in than you would get in those earthquakes.
3 So the tests give you a lot margin, really, for most
4 earthquakes.

5 MR. CHOKSHI: Plus, you know, these are
6 not the type of thing you can analyze in any
7 meaningful fashion, you know? These are functional
8 failure models and I think you have to test. So the
9 test program, again, it's, you know, as Cliff
10 mentioned, these are the high frequency sensitive
11 components; relays, contactors, circuit breakers. The
12 things which will, because of the chatter, or high
13 frequency, will get you into either lockout, you know,
14 lock-in, or ceiling circuits.

15 And the other important thing is, this is
16 applicable for the plants which are screened out based
17 on the 1 to 10 Hz, but there is exceedances in the
18 high frequencies, so a lot more plants will have to
19 really use this information. Then I'll tell you a
20 little bit more about what the test program is, and
21 luckily, we have Jon Richards, because he's managing
22 the program for EPRI.

23 MEMBER BROWN: Nilesh, is that going to be
24 on a plant -- each licensee will have to evaluate
25 their stuff individually and determine whether they

1 need to do their own testing or is that going to be a
2 generic --

3 MR. CHOKSHI: Test is generic and they are
4 collecting, actually, the representative sample for
5 all of the components.

6 MEMBER BROWN: Who's doing that?

7 MR. CHOKSHI: This is EPRI.

8 MEMBER BROWN: Oh, so EPRI is going to
9 take, like, relays, or contactors, or switches, or
10 whatever. But all relays, and all switches, and all
11 contactors are not uniform throughout the entire
12 fleet, so --

13 MR. CHOKSHI: Well, that's why they are
14 collecting the samples, you know, that they can cover
15 the wide range of the components. And then those test
16 results then would be used by the individual licensees
17 to, I'd say, how that equipment, you know, meets, you
18 know, this particular part of the SPID. Okay. So
19 it's a generic program and let me tell you a little
20 bit more about, actually, what the program looks like.

21 The program was developed in two phases.
22 And the phase 1 is complete, okay? And the phase 1
23 was a pilot effort to develop all the computings to
24 understand fully all the parameters, testing
25 protocols, because there is a -- we're talking about

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1 a large number of components. So before they actually
2 go into to start doing the testing, they wanted to
3 make a number of things, the ability of, you know, the
4 shake table for the motions, what are the right range
5 of frequencies, you know, and how do they actually do
6 the testing?

7 You know, workout all the potential issues
8 and based on the phase 1 test program, they did revise
9 their original phase 2, you know, proposal. And so
10 what's in the SPID now, it reflects the lessons they
11 have learned from the phase 1. And for example, now,
12 in the phase 2, they are going to look at the 20 to 40
13 Hz range. Initially, it was 60 to 64, if I remember
14 right, and now, based on the testing, this is probably
15 a much better control, plus, this is the more
16 significant range, you know, they need to worry about.

17 So the phase 1 is complete.

18 MEMBER STETKAR: Nileshe, in phase 1, did
19 they look at, I don't know what equipment they looked
20 at, did they look at any solid state equipment? Not,
21 you know, chipsets, but --

22 MR. CHOKSHI: I think they were only
23 looking in the solid state, only the mounting and
24 connections, Jon. That's the extent of the things we
25 are looking at solid state, if I remember right, you

1 know, because the idea was whether this, you know --

2 MEMBER STETKAR: Yes, okay.

3 MS. KAMMERER: Jon Richards is saying yes.

4 MEMBER BROWN: Let me amplify or expand on
5 the other question just a second. You say it's going
6 to be a generic test, EPRI is doing this, to cover so
7 that all licensees will then have a base from which to
8 draw their information, but how does EPRI determine
9 what the frequency and amplitude that they have to
10 deal with if they don't have the GMRS's already
11 defined for all the various licensees?

12 MR. CHOKSHI: I think the good question,
13 because of that, not knowing that, they have defined,
14 knowingly, very high level with the view that, you
15 know, when actual licensees are coming, they'll be
16 bounded by this.

17 MEMBER BROWN: Okay. The existing IEEE
18 standards and other things for qualification testing
19 under these regimens, or regimes, are not necessarily
20 going to be suitable, the existing standards are not
21 necessarily suitable for any of the new GMRS's that
22 are defined, the accelerations and frequencies, which
23 you may find. So are they going to define a new level
24 based on this?

25 MR. CHOKSHI: Yes.

1 MEMBER BROWN: So they're not going to be
2 relying on existing standards to say those are okay.

3 MR. CHOKSHI: Yes, the input motion,
4 particularly, is very carefully chosen to reflect the
5 characteristic of what we expect the GMRS to look
6 like.

7 MS. KAMMERER: Yes, and maybe Jon can
8 correct me if I'm wrong, but phase 1 was really
9 focused, not only on -- there's a sampling of
10 equipment that got to the breadth of equipment out
11 there, but there was a significant effort looking at
12 the different inputs, so different types of the waves
13 came in focuses on different portions of the frequency
14 band.

15 Some of the work was conducted to verify
16 some of the applicability of standard testing, and so
17 that's why a smaller number of components were
18 conducted there, but it was a very broad program in
19 terms of the input to try to really answer,
20 fundamentally, some of the questions about how the
21 right way to conduct the broader program where a much
22 larger number of pieces of equipment were tested.

23 And so it might be of interest to look at
24 the phase 1 to see what was conducted, and as Nilesh
25 said, they're basically taking the amplitudes as high

1 as possible to make sure they --

2 MEMBER BLEY: Okay. Relative to that, are
3 they doing both symmetric vice asymmetric type
4 frequencies?

5 MEMBER BROWN: Let me offer you something
6 on that, Charlie, because about 25 to 30 years ago,
7 mechanical folks were doing this testing and then they
8 got electricals into it as well, and there was a big
9 program that went on for many years, but they finally
10 realized they needed to test circuits powered, to test
11 the electrical --

12 MEMBER BLEY: Kind of a good idea.

13 MEMBER BROWN: Well, they hadn't been
14 doing that before, but this was a long time ago and
15 then they learned that, yes, it makes a difference, so
16 they've been testing, and I think that's still going
17 on, and they test a whole circuit arrangement powered
18 and then with power and without to see what happens;
19 what's different under those conditions.

20 MS. KAMMERER: And also switching state.

21 MR. CHOKSHI: In phase 1, and Jon, correct
22 me, but they found that energized circuits generally
23 don't have the problem. It's the de-energized that
24 tends to be the --

25 MEMBER BLEY: At that time, one of our

1 friends came in my office and said, did you relays are
2 polarized, or something, what are you talking about?
3 He said, well, look, I'll hook a battery up to this
4 thing, and before that, I shake it, and you could hear
5 him shake, I hook this up and they don't shake. I
6 said, well, there's a giant electromagnet that. But
7 they know that now so they're being very careful about
8 that.

9 MR. RICHARDS: Yes, this John, in specific
10 answer to your question, in phase 1, we ran testing on
11 a variety of different styles of testing. We ran sine
12 sweep testing in one axis at a time, all three axes
13 separately. We ran random multi-frequency testing,
14 all three axes together. We did some of that with,
15 effectively, a sine bead imposed on top of that to get
16 some narrow banded things on top, so we ran all that
17 kind of variations and came back to the idea that a 20
18 to 40 Hz test, all three axes at the same time, with
19 the parts powered, at least monitored and all that,
20 was an effective way of doing testing to figure out
21 the high frequency sensitivity for the parts.

22 MEMBER BLEY: Okay. But when you say it's
23 all powered, but then, this is based on my experience,
24 that I had a lot of stuff that is not powered and that
25 you don't want to actuate and start something in the

1 process, even momentarily, you can create problems.
2 So I don't understand, if you did no unpowered testing
3 for certain types of contactors, relays, switches,
4 then that could be a problem.

5 MR. RICHARDS: Yes, the relays, and
6 contactors, and switches are most sensitive when
7 they're de-energized, and you monitor the contracts to
8 see if they bounce open, and that is the controlling
9 case. We also ran testing with the relays energized
10 to hold them in position, and we found out that they
11 didn't chatter, actually, up to our table --

12 MEMBER BROWN: Similar experience.

13 MR. RICHARDS: Yes, exactly.

14 MEMBER BLEY: But if I can go a little
15 further, at least to one, and I didn't look through
16 the phase 1, but at one time in the past, they also
17 have whole circuits. So they'll have those contacts
18 hooked up to a valve, or something, to see if you
19 really move the device you care about during this
20 chatter. Is that still true?

21 MR. RICHARDS: Yes, in our case, we're
22 just testing the relay.

23 MEMBER BLEY: Okay.

24 MR. RICHARDS: We're not doing a whole
25 circuit, and we're going to do a lot of relays. But

1 you're right, there is an opportunity, and I think
2 there's a slide that'll come up that'll indicate that,
3 to look at the circuit that you're using that relay in
4 to determine whether or not it's critical.

5 MR. CHOKSHI: How it is used, I think I'm
6 going to go through. And I think one important thing
7 is that, this is an ongoing activity. So we are still
8 interacting with the industry. We've been focused on
9 other things now, the phase 1 results, we haven't
10 discussed in details, so phase 2, so I think it's
11 ongoing process. But to me, this is probably one of
12 the most important outcomes because we have been
13 wrestling with this question for a long time and I
14 think this gives a lot more better perspective on the
15 whole issue going through, you know, more of this.

16 So let me go to the next --

17 CHAIRMAN SCHULTZ: I wanted to catch John
18 while he was there. I wanted to understand what is
19 the right way to characterize how the 20 to 40 Hz
20 range captures what happens from 10 to 20 Hz, because
21 this morning, earlier, we were talking about high
22 frequency, that would be above 10, so what's the right
23 way to characterize how that covers it?

24 MR. RICHARDS: So the answer to that is
25 that, normal qualification is taking care of that

1 frequency range. So the normal qualification under
2 the IEEE standards for relays would be a peak between
3 4 and 15 Hz. By the time you get the shake table to
4 do that, it's kind of rolling off at around 20. And
5 so that's one of the reasons that we can start at 20,
6 because that lower frequency is already covered, we're
7 trying to figure out what's happening at the high end.

8 MEMBER BROWN: Well, what if the amplitude
9 of the GMRS is even higher than what the IEEE standard
10 test demanded when those tests were run?

11 MR. RICHARDS: Right. So what would
12 happen, and in the big picture, is that you'd
13 probably, in that case, be ending up in a full risk
14 evaluation, and you'd have a capacity established for
15 the part, and you'd end up considering that into the
16 fragility calculations.

17 MEMBER BROWN: So you'd have to do it
18 based on this additional analysis, or risk assessment
19 --

20 MR. RICHARDS: Yes.

21 MR. CHOKSHI: Yes, there is a flowchart,
22 it's coming, I think, after this slide, how these
23 results will be used in actual evaluations.

24 CHAIRMAN SCHULTZ: Let's go forward then.
25 Thank you, John.

1 MR. CHOKSHI: Okay. So now the phase 2,
2 and I think the first phase 2 testing is sometime in
3 May. John, am I correct? So they are starting on the
4 phase 2 test which will, again, we can expand the
5 sample of the high frequency to cover the distribution
6 of manufacturers, you know, address the diverse
7 population in the plants.

8 And then again, it's a variety of
9 mechanical motions and we try to cover as much as we
10 can in this program so most of the licensees can use
11 for their, you know, facility.

12 MEMBER BROWN: Okay. This is maybe too
13 far down on the grass if it is, I understand covering
14 all the manufacturers, but there is a vast array of
15 manufacturers that make these components, relays,
16 contactors, et cetera, et cetera, and you can look at
17 a particular manufacturer, my concern is somebody
18 says, hey, this guy's is similar to somebody else's,
19 therefore, we'll test this one and it's okay.

20 But yet, if you look at the contents of
21 the springs and/or whatever manner they use to hold
22 them open or closed in various circumstances to
23 counteract so they don't prematurely actuate, all that
24 kind of stuff, there's a lot of nuances in terms of
25 the detailed design of those components, including the

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1 electromagnetic forces that are applied when they're
2 on and everything else.

3 Some hold, some are not quite so beefy and
4 robust, so the generic stuff has to be -- you have to
5 really cover the waterfront.

6 MR. CHOKSHI: Yes, this was actually one
7 of the big point of discussion. And the way to at
8 least get around some of this question is, they are
9 actually getting some of the components from the
10 facilities, because, you know, as you said, people
11 replace things and sometimes, you know, you can't
12 necessarily find the same component. So I think, like
13 John described, because this was one of the big
14 issues, how are you going to, you know, test all the
15 variety of things out there?

16 MEMBER BROWN: I mean, one other point,
17 again, another small detail is, things fail in normal
18 operations and now you get a replacement, that
19 replacement may not be the same as the one you
20 originally had in there ten years ago. It may not
21 have the same robustness, it may not have exactly the
22 same configuration, but electrically and physically,
23 it fits in the space and will suit the application,
24 which has always been somewhat nervous when we're
25 looking at replacing parts; electrical parts.

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1 MR. RICHARDS: I suppose I would say two
2 things. First, we are going through an exercise right
3 now of working with some of the utilities who have
4 relay lists for seismic PRAs so that we can focus, not
5 on all the safety-related ones, but the ones that are
6 showing up in risk assessments that are the most
7 important ones. And so we're using that to try and
8 help focus on what are the right items to look at.

9 For the most part, they will be component-
10 specific capacities. You're right about that. We may
11 be able to draw some broad conclusions, but we'll have
12 to work our way through the process to see what kind
13 of broader conclusions we can draw, but that's the
14 process we're using right now. We probably want, in
15 this process right here, be able to get to a 100
16 percent of the relays that the utilities care about.
17 As they work through seismic PRAs, they might find
18 certain relays that we didn't cover, so we'll have to
19 work our way through that process as we get there.

20 One option is, we could give them the
21 testing protocol and they could execute the test or
22 there may be an opportunity to do some follow-on
23 testing to cover some specific parts.

24 MEMBER STETKAR: In practice, having been
25 through this, what people is, they say, some great

1 Gods tested a bunch of relays, here's what they
2 tested, here are the specs on those relays. I have
3 some of those, I got some other things that aren't
4 those. I'm going to claim that, you know, relay X is
5 like relay 37 that they tested. And then it's
6 incumbent upon me to justify why relay X is like relay
7 37.

8 And in some cases, if you can't justify
9 that, sometimes people just replace the relays because
10 it's cheaper to do that.

11 MR. CHOKSHI: Actually, you have three
12 choices at that point in time.

13 MEMBER STETKAR: Honestly, that's the way
14 it's shaken out in the past. Pardon the pun.

15 MR. CHOKSHI: And that's what the next
16 slide too, you know, you have, basically, three
17 choices; either you do a circuit analysis and show
18 that doesn't matter, that, you know, this relay,
19 whether it, you know, functions or this functions,
20 doesn't cause me, from this perspective, any problems;
21 replace a component with something which has already
22 been tested; or do a fragility analysis, you know, by
23 -- at that point, you might do additional tests for
24 your own specific thing, or you try to come up with
25 some, you know, other argument, similarity, and other

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1 things.

2 So the testing will provide, sort of,
3 overall, you know, framework of what -- and to the
4 extent people can use, directly, the results, they
5 will use it, otherwise, they will have to go through
6 this process. So it would have to be brought back
7 into the, you know, risk evaluation and we might
8 windup seeing some of those actually modeled into the
9 PRAs.

10 → MEMBER STETKAR: Nileshe, on this chart
11 here, that lower left-hand corner, it says, "Credit
12 Circuit Analysis", I understand what that means, or
13 operator action, and there are a couple of things in
14 the SPID, and I'll read you a quote, "In the case of
15 the annunciation following an earthquake, operators
16 will reset control room annunciations and then
17 evaluate those annunciations that do not properly
18 reset. These are examples where relay or contactor
19 chatter is considered acceptable."

20 That says any relay or contact chatter
21 than can create any kind of spurious signals in the
22 control room is okay because I know the operators will
23 reset the stuff and respond perfectly to what is left.
24 And that seems to be a basis for screening out relay
25 chatter as a source of spurious indications in the

1 control room.

2 There are other statements, it says,
3 "Other relay chatter effects can be resolved by
4 operator actions. Examples include resetting lockout
5 or seal-in relays that lead to undesired plant
6 conditions. In general, the above approach ensures
7 the adequacy of potentially high frequency sensitive
8 components and specific demand to capacity comparisons
9 or calculations of the required fragilities for
10 inclusion in the seismic PRA models will typically not
11 be required."

12 So it sounds like the SPID is saying,
13 well, I can invoke that little word, operator action,
14 down there without doing a detailed evaluation of
15 human reliability, because I know that operators will
16 reset those annunciators, and I know that they will
17 respond correctly.

18 MR. CHOKSHI: Yes, I think some of that
19 comes from the few plants where we have done
20 exhaustive relay chatter-type of evaluation. I can,
21 you know, count about three or four, and some other
22 stories, but I think is, again, one of those things
23 when we will have to look at that, you know, and this
24 is where --

25 MEMBER STETKAR: But I didn't see any

1 cautions in anything from the staff saying --

2 MEMBER BLEY: And I'll tell you the truth.

3 MEMBER STETKAR: -- you're not endorsing
4 that.

5 MEMBER BLEY: Most operators are really
6 good on the mechanical stuff, not electrical, and the
7 things in these circuits that can positively lockup
8 are very obscure, and unless you can go to the prints
9 and chase them down, which can take some time, it's
10 not, you push a button and everything's back to
11 normal.

12 MR. CHOKSHI: The two I'm familiar with,
13 Hatch and Diablo, it was exhaustive circuit analysis.
14 You are right.

15 MEMBER BLEY: Diablo I know did. I didn't
16 know Hatch did it.

17 MR. CHOKSHI: Yes, Hatch did it when they
18 were doing their seismic margin, and those were the
19 two studies I would point to anybody looking into the
20 details, but you are right, it's a tremendous amount
21 of work. But I think what you are saying, I think
22 this is something in our review guidance we will have
23 to focus on.

24 MEMBER STETKAR: Yes, I do know that, you
25 know, real cautions or anything in there --

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1 MEMBER BLEY: Since you brought that up,
2 I do know that Diablo put their own electrical
3 engineers through all of those circuit diagrams and
4 built a book of this, which wasn't there before they
5 did the analysis, so that they could support their
6 operators if they needed to do that.

7 MR. CHOKSHI: I don't remember the name of
8 that person, Bruce, maybe you worked with quite a bit
9 --

10 MEMBER BLEY: I haven't seen him in ages,
11 but yes.

12 MR. CHOKSHI: Yes, this issue is one of
13 those things, again, that's why I think, to me, in
14 overall process, that the peer review, and I'm going
15 to talk it towards to the end, becomes so critical and
16 why the in-process period becomes so critical when
17 these judgments are being made.

18 MEMBER BLEY: I do agree with John on this
19 one because it's much more obscure than most people
20 would think.

21 MS. KAMMERER: But let me clarify
22 something. So this whole study is still ongoing, as
23 we were just talking about. The main portion of the
24 work is being done in May, in terms of the testing.
25 It was always the idea that additional guidance that

1 comes out of this would be developed in terms of how
2 this is used specifically in the PRA.

3 MEMBER STETKAR: Except the SPID is
4 saying, I don't need to worry about it because I can
5 take credit for operator actions, so that it doesn't
6 have anything to do with the relay chatter testing
7 itself, and it doesn't have anything to do with the
8 peer review if the peer review is being done according
9 to the guidance in the SPID. The SPID says, I can
10 toss this out, I've tossed it out, the peer review
11 team comes in and says, you tossed it out, that's
12 consistent according to the SPID, everybody's happy.

13 MS. KAMMERER: But additional guidance in
14 terms of how it's implemented in the PRA is part of
15 this program.

16 MEMBER STETKAR: Except in the SPID that's
17 been endorsed by the NRC staff, it says, I don't need
18 to consider this particular issue because I can take
19 credit for the operators. It doesn't say I have to
20 perform a human reliability analysis. It doesn't say
21 I have to perform a timing analysis to see what's
22 going to happen if I have a seal-in relay locked in
23 and the operators don't decide to do something. It
24 just says, I can, basically, screen-out those types of
25 impacts.

1 MR. MUNSON: One thing, also, you have to
2 remember is, if you look at the GMRS, right, what
3 kicks you into a risk evaluation? If you have
4 exceedances between 1 and 10 Hz. Now, if you're in a
5 risk evaluation and you have exceedances between 1 and
6 10 Hz, you generally aren't going to have the type of
7 high frequency rock spectrum that just kicks you into
8 referencing the high frequency testing by itself. So,
9 I mean --

10 MEMBER STETKAR: Let's take the example,
11 though --

12 MR. MUNSON: -- the demands in the high
13 frequency range for a plant that's doing a PRA, that's
14 because the GMRS succeeded between 1 and 10 Hz, the
15 demands, generally, aren't as high in the higher
16 frequency range.

17 MEMBER STETKAR: Let's take the site, your
18 traditional site that is absolutely fine from 1 to 10
19 Hz, but it's exceeded at greater than 10 Hz, a
20 distinct possibility for a fraction of the sites in
21 the Central and Eastern U.S., for those sites, they
22 have to go through this type of process that's, sort
23 of, illustrated on this screen here. It doesn't say
24 that they have to do a seismic PRA, but they have to
25 do something, and the problem is, the something in the

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1 operator action just says, well, the operators are
2 going to be perfect because they know exactly what to
3 do and I can take credit for the operators doing that.

4 It sounds an awful lot like fire analysis,
5 that I'm going to take credit for operators being
6 perfect for all of my fire scenarios so I don't have
7 any worry about any of this stuff. Now, Nilesch says,
8 you know, if they have problems and they don't want to
9 replace the equipment, and it doesn't meet the seismic
10 capacity, they may have to do a risk assessment, and
11 I think the implication is that.

12 MEMBER BLEY: I'd even go further, even if
13 they do a risk assessment, unless they got real
14 electricals onboard, they might not spot this. I
15 think this is worthy of a warning. This is fairly
16 subtle to fix this problem and if it's day shift and
17 everybody's there, somebody will probably fix it. If
18 it's not, okay, maybe not even then.

19 MEMBER STETKAR: Maybe. I'll give them
20 some non-zero probability there.

21 MEMBER BLEY: But if it's not day shift,
22 they're going to sit there for a very long time.

23 CHAIRMAN SCHULTZ: Nilesch, have we made
24 our point?

25 MR. CHOKSHI: Yes, but I was just looking

1 into the documentation part, how do we -- I understand
2 your point and how do we get to know what judgments
3 they are making? And I think we need to think about
4 that.

5 CHAIRMAN SCHULTZ: Well, because the SPID
6 seems to be fairly clear.

7 MR. CHOKSHI: Yes, we need to think about
8 that.

9 CHAIRMAN SCHULTZ: Okay.

10 MR. CHOKSHI: That's a good point because
11 we like to -- yes, it's complex, that I know, and it's
12 not obvious.

13 MS. KAMMERER: Can I ask, maybe, EPRI,
14 when do you intend on putting out additional guidance
15 that was based on the outcome of phase 2, just in
16 terms of the timing for that?

17 MR. RICHARDS: Yes, phase 2 testing starts
18 in May with a test every month, one week every month,
19 through November, take a break for Christmas, and then
20 again, January, February, March, so it'll be some
21 time, a month or so, two, after that that we'll have
22 a summary report that will roll-up all the results.
23 Now, we'll have some insights along the way, but, you
24 know, it'll be into the second quarter of next year,
25 we'll have a roll-up of the results.

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1 And we will be providing some
2 recommendations on how to apply the results at that
3 point.

4 MR. CHOKSHI: Yes, and I think as Annie
5 said, that may be an opportunity to look at it
6 comprehensively.

7 MS. KAMMERER: Yes.

8 MR. RICHARDS: Right.

9 MR. CHOKSHI: Thanks. That's an important
10 point, yes. You know, one of the key experience and
11 lessons learned from the IPEEE, and so on the
12 previous, doing the PRN margin analysis, that you have
13 to be very careful when you do the screening of the
14 components. And then when we are writing standard, a
15 lot of attention was paid to that particular element.
16 And I think this SPID comes up with a process, which
17 I think, probably, can be used broadly, not only for
18 this application, and it really is a very carefully
19 thought-out process, plus they have done supporting
20 studies.

21 What it does is to split components in,
22 basically, three categories. One is what we know and
23 there is no, you know, controversy or any -- you know,
24 everybody agrees that some components are inherently
25 very rugged, you know, they're like wide body or

1 things like that. It's very clear. And there are
2 components we know that needs to be evaluated. You
3 cannot make a judgment whether they are automatically
4 -- it's the middle component. Middle components are
5 the problematic, that you know it's high capacity, but
6 you're not sure that you're going to throw them out of
7 the analysis, but do you want to spend an effort to do
8 the detailed analysis of that?

9 So this is what this position addresses,
10 and it's critical because we found that the ability of
11 some of the IPEEE analyses was not as high because the
12 screening was done, not properly, and that left, you
13 know, some -- you could not, John can speak to that,
14 use in a future application, so I think it's very
15 important.

16 So what does this position focuses into
17 the single block? It basically says that if the
18 components are identified as a high capacity, we had
19 to come up with different nomenclature, inherently
20 rugged, high capacity, and which doesn't meet those
21 two. So for those high capacity components, the
22 position basically says that you will allow them a
23 screening label for fragility.

24 You will not do a very specific
25 calculations, but you will come up with a screening

1 level. You want to keep them in the model. So what
2 that should be the screening level? And the screening
3 level, there is two ways, as shown here, either the
4 HCLPF capacity is about 2.5 times the GMRS or it's
5 equivalent to that HCLPF that leads to the fragility
6 frequency of 5 times 10 to the minus 7.

7 Both of these will lead to a very site-
8 specific screening level because it depends on the
9 shape and the level of the hazard. And so you will do
10 that, include into the model, but in the end if you
11 find when you go through the analysis that these
12 components turnout to be, actually, one of the
13 dominant contributors, then you will go to that
14 additional check; how much really.

15 Then the way you do is by artificially
16 increasing the capacity very high and see how much
17 reduction you get into the core damage or whatever the
18 metric you are trying to look at; LERF or core damage.
19 So I think, to me, this is, again, probably an
20 important element and I think it really addresses one
21 of the key, you know, things we have found, and this
22 gives us arms around handling this issue because
23 otherwise, it was pretty much dependent on the usual
24 things and how the people applied the screening
25 criteria. So this is, in my view, an excellent

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1 development.

2 So now, in addition to these response and
3 capacity parts of the fragility, also, the SPID
4 addresses the large early release frequency. Another
5 important is the comparison to ASME/ANS, and I'll talk
6 about little bit more, I think, why it's important,
7 and some of the things we discussed earlier in the
8 hazard come into the play of the rough information
9 when you look at the future.

10 Peer review, that's important and I think
11 I know the committee was interested in knowing the
12 peer review process and, you know, why. We also spend
13 a lot of time on documentation. That was another
14 lessons learned from the IPEEE. But there was
15 extensive guidelines in IPEEE, but what came in, not
16 necessarily, every case followed. You know, so I
17 think this now, having that incorporated in SPID, I
18 think, will ensure better consistency across the
19 board.

20 It will also give us, you know, a better
21 review document. And then I'll touch on spent pool
22 fuel integrity evaluation. On the ASME/ANS PRA
23 standard, one of the goal, I think, and the SPID
24 discusses, that they basically want to try to meet the
25 category, second category, of the standard, so that

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1 can be used to widen it. And so they have gone
2 through and compared by both high level and the
3 supporting requirements, both from the Addendum A
4 2009, which is the version out on the street, and
5 Addendum B may be already out, because the last I
6 heard was, it was in publication.

7 I haven't received my final copy. I have
8 the copy because I worked on it, but I don't have,
9 actually, official copy. But they went through all of
10 these requirements, how they are meeting for these
11 purposes, and, you know, also was to judge whether it
12 will hold up for some other application. One of the
13 things, if you look in the SPID, we say that, you
14 know, if you want to use this PRA for the future, you
15 have to meet some of the key standard requirements.

16 It has to reflect the current planned
17 configuration, you know, then updating the hazard,
18 because we know the hazard thing changes. So I think
19 this is an important element and it also lays out a
20 path for the future use. So this is very valuable
21 also, for some other people, you know, for doing the
22 PIFR, different connection, this will serve, to me, as
23 somewhat of a roadmap, or some guidance, so this was
24 an important element.

25 And it was useful, I think, for everybody

1 involved to go through that. The peer review. The
2 peer review is the one interesting -- we had a lot of
3 discussion. As the discussions were ongoing, the NEI
4 put out their guidance for the external hazard peer
5 review independently of the discussions we were having
6 with the NEI task force.

7 Now, that peer review process followed
8 very similar to the internal event. It does not
9 distinguish between the in-process or at the end of
10 the completion of history, neither does the standard.
11 Reg Guide 1.200 has a requirement about the peer
12 review, so we were trying to bring all of that
13 element. And one of the critical piece we wanted to
14 bring into the process was this concept of in-process
15 peer review.

16 And to me, and I think everybody involved
17 in the seismic PRA, it does not make sense to wait
18 until the end because there is always reluctance to go
19 back and do my analysis. And so much, you know, it
20 depends on the type of things we talked about. You
21 are making judgment all along the process and you need
22 that different collective set of eyes. And so the
23 biggest thing, I think, is the in-process peer review.
24 We made it that that is acceptable.

25 → MEMBER BLEY: Well, it's acceptable. It's

1 a shame that's all we can say.

2 MR. CHOKSHI: You know, but the amount of
3 confusion -- and we may have contributed partly to it,
4 because we started with a participatory peer review,
5 which SSHAC endorses, but the participatory imply
6 different things to the different people, and that's
7 why if you look at the sub-bullets, that we still want
8 to maintain independence, you know, because peer
9 review person is involved and they still need to look
10 at the end overall process, because looking at
11 different pieces, you may be making, you know,
12 decisions which, in the end, you need to look at
13 comprehensively.

14 So that's, I think, the biggest, you know,
15 important element into this.

16 MEMBER BLEY: Are we likely to get any in-
17 process peer review? So I mean, if it's only
18 acceptable. If it's not a requirement.

19 MR. CHOKSHI: Well, I think, no. The
20 thing is that --

21 MEMBER BLEY: It costs more. Maybe in the
22 end it doesn't when you have to fix --

23 MR. CHOKSHI: But our discussion with the
24 industry was, they would prefer to do in-process peer
25 review.

1 MEMBER BLEY: Really?

2 CHAIRMAN SCHULTZ: I think the industry
3 was actually promoting that.

4 MEMBER BLEY: Good. Okay. That
5 encourages me.

6 MS. KAMMERER: It was really a necessity
7 on our part to clarify that it was acceptable.

8 MR. CHOKSHI: Because there was a running
9 --

10 MS. KAMMERER: Because industry wanted it,
11 most of the NRC staff wanted it, but --

12 MR. CHOKSHI: Because the standard --

13 MEMBER BLEY: There's a part of you that
14 says you have to be totally independent and look when
15 everything is done.

16 MR. CHOKSHI: Everything is done, because
17 the standard --

18 MEMBER BLEY: It's a different kind of
19 review, but it's not really helpful for what we're
20 doing.

21 MR. CHOKSHI: And the confusion was coming
22 because the standard was silent. It didn't say that
23 you can't do it. And so that's the reason, I think,
24 to make explicitly clear that you can do, you know,
25 that was important.

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1 MS. KAMMERER: I think in the SMA
2 guidance, we did manage to say that it was preferred
3 in the end. I think that one slipped under the radar.

4 MR. CHOKSHI: Actually, that's where the
5 dialog started because we had to put out our SMA
6 guidance before the SPID, so we sat on that issue
7 there and the SPID, basically, brought it into the,
8 you know, light.

9 MS. KAMMERER: And just to clarify. We
10 started out with one process, but what we ended up
11 with was that the -- because originally, the
12 discussion was going on in terms of the SPID, but it
13 turned out there was, sort of, this parallel path was
14 also happening in research, and we were able, then, to
15 bring alignment between some of the work in research
16 and then the work for Fukushima.

17 So what ended up happening was, that
18 research put out a document endorsing, with
19 clarifications, the NEI document, and the
20 clarifications, and I think there were a few
21 exceptions, but it clarified that, according to the
22 NRC staff, we just want to clarify that either of
23 these approaches are okay.

24 CHAIRMAN SCHULTZ: So Nilesh, looking at
25 the three bullets, what I gather is that the desire

1 was, in fact, to maintain in-process peer review, but
2 that there was some concern that, how does one remain
3 independent if you get involved in the process and the
4 project early on and start to be thinking as if you
5 were the -- part of a different team than the peer
6 review team?

7 But then, the third bullet suggests that
8 perhaps only a few of the peer review team would be
9 in-process, but the whole peer review team, there'd be
10 others that would remain independent? Is that --

11 MR. CHOKSHI: Yes, the thought was that,
12 for example, you are making a key assumption in the
13 area of fragility. A person which meaningfully can
14 provide not, maybe from the entire team, two or three
15 people who are, you know -- but in the end you want to
16 look at -- every member of the team needs to look at,
17 are the studies done to make sure that everything now
18 comes together, you know, and makes sense.

19 CHAIRMAN SCHULTZ: Which is more of a
20 cross-disciplinary review.

21 MR. CHOKSHI: Cross-disciplinary and
22 overall, you know, that all these different pieces is
23 giving me, you know, insights. Does it make sense,
24 you know?

25 CHAIRMAN SCHULTZ: And the guidance on

1 that third bullet, my interpretation of that is,
2 that's the peer review team is the peer review, the
3 same bodies, for the entire project because there's
4 been some bad experiences from the fire analyses where
5 peer review team A came in and gave them some comments
6 and then, you know, a couple years later peer review
7 team B, different bodies, came in and just said that
8 the things that peer review team A said was okay or
9 were terrible.

10 So you do get deviations among peer review
11 teams, depending on the bodies. That's been a
12 complaint among some of the people doing the fire
13 analyses.

14 MR. CHOKSHI: And the NEI guidance and our
15 ISG addresses those type of things. Right. Exactly.
16 You know, how do you do that? So why don't we go to
17 the next one. Spent fuel pool, basically, the focus
18 here is on the rapid drawdown, okay? And not as much
19 on the structural strength. The structural strength
20 is only addressed in the term of, that you need to
21 make sure that there is a checklist, which is NUREG-
22 1738, which was the decommissioning study.

23 And some of that, sort of, qualitative
24 aspects to make sure that you don't have any obvious
25 things which is outside of the, you know, information

1 used to confirm that your structure has the margin and
2 strength. And then it focuses on, basically, to the
3 way of you can lose the inventory, looking at the
4 penetrations, looking at the syphoning effects, and
5 other potential effects, such as the sloshing due to
6 the, you know, earthquake motion.

7 And then when you do that, again, you
8 address those things in, basically, two or three ways.
9 First of all, whether it's of any consequence. You
10 know, as you see on the flowchart, penetration not,
11 you know, for 72 hours, there is no uncovering. And
12 if it turns out that you cannot address and answer
13 that in years, then there is two ways to look at it,
14 whether there is, seismically, enough capacity that
15 you want get the penetration, it will remain intact,
16 or look at your make of capacity that you can quote
17 with that.

18 Now, you know, so that's the focus on
19 spent fuel pool is more, you know, in that and it's
20 not a risk evaluation like for the reactor. So that's
21 all I planned to say on this.

22 MEMBER STETKAR: I think I know the answer
23 to this, but I've actually forgotten. Is the
24 requirement for the licensee to look at all modes of
25 operation?

1 MR. CHOKSHI: No.

2 MEMBER STETKAR: Oh, then I didn't know.

3 MR. CHOKSHI: Let me think about that.

4 → MEMBER STETKAR: In particular, the
5 concern is, during refueling operations, there may be
6 seismic failures that can result in a drawdown of the
7 spent fuel pool that are not present during normal
8 operation. In particular, because the fuel transfer
9 canal is opened and gates are opened, so you may
10 expose yourself to seismic failures. Some plants have
11 drain connections to the bottom of the fuel transfer
12 canal, that if they break, you can drain down, at
13 least to the bottom, so the transfer slots in the fuel
14 pools, not a complete drain down below the top of the
15 active fuel, but certainly, a lot of water.

16 So if the licensees were required to look
17 at seismic failures during all modes of operation,
18 that, in principle, would pickup those types of
19 failures. I thought that they did. That's why I was
20 surprised when you said no, so I'm glad I asked.

21 MR. CHOKSHI: Yes, because it's been a
22 while since we have been discussing that. Let me come
23 back to that.

24 MEMBER STETKAR: Okay. Thanks.

25 MEMBER BLEY: Let me ask you one more

1 thing about that. It talks about breaks in lines and
2 other things that could drain it. Do you need to do
3 the circuit analysis part two to see if there's some
4 way you can open up a valve and pump it down, and if
5 not, why not? Most plants, you can't pump it all the
6 way down, but you can pump it down real close to the
7 top of the old fuel.

8 MR. CHOKSHI: Because of the type of --

9 MEMBER BLEY: Yes, exactly. And you drive
10 a gate valve of its seat, it doesn't have to go very
11 far before it's got almost full flow through it. It
12 doesn't have to open wide, it opens a few percent, and
13 you'll get a lot of water through there. I don't see
14 any specific words -- you know, there's words that one
15 could interpret that way. You have to look at ways
16 you might drain it down, but there's nothing that
17 really says you ought to look at it.

18 MR. CHOKSHI: Yes, we didn't explicitly
19 say that, you need to look at the areas. It's just a
20 general --

21 MEMBER BLEY: Well, it's kind of reach to
22 read it into it.

23 MR. CHOKSHI: That's a good point, but
24 it's not --

25 MEMBER BLEY: I think you ought to look.

1 I mean, it's pretty unlikely, but not all of them are
2 hooked up the same way.

3 MR. CHOKSHI: That's a good point. Yes.
4 We didn't discuss that specific scenario.

5 MEMBER CORRADINI: I wanted to know, the
6 72 hours, where did the 72 hours come from as a
7 decision point?

8 MR. CHOKSHI: Now, it comes, probably,
9 from many things, because there is also the whole flex
10 and other things, you know, which is a long-term, but
11 I think that the 72 hours, I think, we have used many
12 places. By that time, you can probably do a number of
13 things for the makeup capability and if you had to.

14 MEMBER CORRADINI: So okay. So that's
15 what I guess I was -- I assumed it had something to do
16 with some auxiliary equipment that was sized such that
17 if it really took three days to drain down, you could
18 put something in that could refill with the drainage,
19 but I just wanted to make sure.

20 MEMBER BLEY: Yes, and this would assume,
21 I'm assuming, that this implies they would start the
22 drain down right after the earthquake.

23 MR. CHOKSHI: Right.

24 MEMBER CORRADINI: So if it takes three
25 days, then it's a pretty small leak.

1 MR. CHOKSHI: Right. Yes. There is some
2 discussion in the SPID about the 72 hours, but again,
3 it will be the ability to bring in, you know --

4 MEMBER CORRADINI: All right.

5 MR. CHOKSHI: Let's go to the next one.
6 Okay. This shouldn't, hopefully, won't take long,
7 because, you know, after we briefed the ACRS in
8 August, it was issued for public comments. I think
9 there were some comments which were incorporated and
10 we had, I think, discussion about how we were
11 addressing these comments. And then the version went
12 out into the September 2012. We got comments, but
13 very few comments, I would say, of any kind of
14 substance. I would say almost none. Most of them
15 were clarification.

16 MS. KAMMERER: No, there was no comments.

17 MR. CHOKSHI: And one of the things I
18 attribute, you know -- as we move toward enhancing the
19 RSM into looking more like a PRA, and as the PRA
20 introduce some use of things like CDFM and stuff, the
21 differences between them narrowed in terms of the
22 effort required. You know, from what I hear from
23 industry, most of the plants will do PRA, which, to
24 me, makes sense. You're going to get a lot more, you
25 know, in the future use --

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1 MEMBER BLEY: On the other hand, it's
2 always kind of made sense, and yet, it hasn't happened
3 very much.

4 MEMBER STETKAR: You heard a lot of
5 people, originally, transferring to NFP-805 too, so be
6 careful what you hear really.

7 MR. CHOKSHI: So we issued finalized
8 numbers according to the schedule. There were,
9 essentially, no change. The one significant change,
10 and I think Annie talked about, this peer review
11 section, and that was actually, you know, we called it
12 the avenue to get that in-process in place. And
13 because it was our guidance, we added the things,
14 provisions, about the team composition, what is
15 independence, more detail, so I think we took the
16 pieces from the other available guide, and so I think
17 it's more comprehensive.

18 I would say, that's probably the only
19 significant change. The other technical positions,
20 will you go the next slide, addressing the main part
21 of the SMA, essentially, unchanged. So all of these
22 things are what you have seen before. All right.
23 Now, I think some more talk about one important
24 development, which I'm sure you have heard about, that
25 industry has proposed what the industry calls

1 augmented approach, what we call expedited approached.

2 There are a number of nomenclatures, you
3 know, the way you look at it. But what it does, and
4 this sort of, if you remember --

5 → MEMBER RAY: Nileshe, let me interrupt you
6 for a second, because I think before we go to this,
7 this is kind of a distinct discussion we're about the
8 enter into, as I look at this, I'm trying to think
9 back on what are the requirements that we're trying to
10 satisfy here? And we didn't start out with a summary
11 of that. I'm sure it's been presented and what you're
12 telling me is, look back at so and so.

13 But what is it that I would want to refer
14 to as the requirements that we're all trying to meet
15 here? Do I just look in the Near-Term Task Force
16 report? Do I look in the authorization bill off the
17 Hill? What is it that we're --

18 MR. CHOKSHI: There are three pieces.

19 MEMBER RAY: All right.

20 MR. CHOKSHI: The one is the task force,
21 which is the high level, it says, here are the
22 recommendations, and we are trying to address
23 Recommendation 2.1, which says that, "You will re-
24 evaluate the hazards at the operating reactor sites
25 using the approach that you are using for the

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1 licensing for new reactors. And then evaluate whether
2 you need to modify design basis or make some other
3 planned modifications." Okay. So that's the overall
4 recommendation.

5 MEMBER RAY: I got number one.

6 MR. CHOKSHI: Right. Then the Commission
7 issued the 50.54(f) letter, request for information,
8 that is March 12, 2012, which lays out the details of,
9 that in order to meet this recommendation, here is
10 what each licensee has to do. What is the request or
11 actions? What is the request or information? It's
12 the information. So that's what we are in that piece;
13 that part of it. That, in order to collect that
14 information, what kind of guidance we need to have so
15 the people can go and generate the information and
16 give it back to us?

17 So hazard re-evaluation we discussed and
18 this criteria is for that, and this, actually, your
19 question is at the very right time, because this
20 figure lays out that process. So if you look at that
21 overall recommendation, and the processes are
22 identified in the 50.54(f) letter, is in two phases.
23 The phase 1 is the collection of information and there
24 are two stages.

25 That first stage, you will do, basically,

1 your hazard evaluation. You are looking at coming up
2 with a new assessment of what we have been calling
3 GMRS. Okay? And at that point, you know, Cliff
4 described the screening part of that. Depending on
5 the outcome of that screening, you go into the stage
6 2, which is the doing the plant risk evaluation, in a
7 broad sense.

8 And when all of that information has come
9 to us as a part of the response to the 50.54(f)
10 letter, the phase 2 is what the later part of the
11 recommendation, and asking you to make a decision,
12 with the regulatory decisions, do they need to take
13 any action.

14 MEMBER RAY: Yes, I mean, I always
15 envisioned that phase 1, as you said, was a gathering.
16 It's got these two stages to it, and phase 2 is
17 something we'll deal with later. We're not trying to
18 say we're defining what phase 2 consists of here, are
19 we?

20 MR. CHOKSHI: No, no. Right now, we are
21 focusing on the phase 1.

22 MEMBER ARMIJO: Well, okay. What is the
23 purpose of phase 2? What is your objective? Is it to
24 find that set of plants that really have substantially
25 greater seismic risk? I hope that's your --

1 MR. CHOKSHI: Yes, and then make the
2 decisions that any regulatory actions needs to be
3 taken to, you know, enhance safety or there is, you
4 know --

5 MEMBER RAY: But we're going to talk about
6 that later, aren't we?

7 MR. CHOKSHI: Later, yes.

8 MEMBER RAY: Because my point is that, at
9 this juncture, we're only talking about phase 1 in
10 terms of what we're trying to accomplish.

11 MR. CHOKSHI: Absolutely.

12 MEMBER RAY: All right. Because that
13 wasn't terribly clear to me.

14 MR. WIDMAYER: Is staff attempting to do
15 the phase 2, if you will, for seismic and flooding at
16 the same time or do you think you're going to have to
17 address those two things separately?

18 MR. CHOKSHI: No, I think, as the
19 information comes in, we will, you know, start the
20 process. So if you look at the timing of the flooding
21 and seismic, not necessarily they coincide.

22 MR. WIDMAYER: Okay.

23 MR. CHOKSHI: Okay. So as we finish phase
24 1, we will move into the phase 2.

25 MR. WIDMAYER: Okay.

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1 MEMBER RAY: Well, just to finish up, my
2 concern is, we'll never realize when we've moved into
3 phase 2. It'll sort of just happen on its own and
4 things will -- we won't have a discreet point in time
5 when, as Sam's asking, what is it that we're trying to
6 accomplish here? And we never ask and answer that
7 question.

8 MR. CHOKSHI: Yes. I think maybe this
9 might help. At the end of the phase 1, there will be
10 a staff evaluation report, okay, that release that
11 information and, you know, first, to make sure that
12 information does address what we request. Do we have
13 a problem? At that point, when you go through this
14 review, it'll be clear which one needs to be evaluated
15 for the phase 2. You know, in some cases, it might be
16 very simple. Plant has a very high capacity, there is
17 no risk, and the process ends there.

18 For the plants which we have a question,
19 then you enter into the phase 2, and use the
20 regulatory processes as shown here for that part.

21 CHAIRMAN SCHULTZ: Are you saying, Nilesh,
22 that the last box on stage 2 is some integrated
23 evaluation that the staff is going to perform?

24 MR. CHOKSHI: No. This is for each
25 licensee. So each licensee, stage 2, the last box, is

1 the -- yes, that's NRC evaluation of, you know, what
2 licensee submit to us. That closes the --

3 CHAIRMAN SCHULTZ: On a licensee-by-
4 licensee basis.

5 MR. CHOKSHI: Licensee-by-licensee, right.

6 CHAIRMAN SCHULTZ: So that'll be over some
7 period of time, evaluation plant 1, plant 2, plant 3,
8 site 1, and so forth.

9 MR. CHOKSHI: Right.

10 CHAIRMAN SCHULTZ: Okay.

11 MR. MUNSON: I think it's fair to say we
12 need to do some work on what the criteria would be for
13 phase 2 and --

14 CHAIRMAN SCHULTZ: During stage 2. Is
15 that what you're saying, Cliff?

16 MR. MUNSON: Yes.

17 MR. CHOKSHI: Because right now, the
18 focus, I think, as you say, is phase 1.

19 MEMBER RAY: Yes, but I wasn't really
20 getting that crispness that you've given to it now,
21 that we're going to talk about phase 2 at another
22 time.

23 MR. CHOKSHI: Yes. I think as Cliff said,
24 we need to do some more work on that.

25 MEMBER ARMIJO: It seems to me, if I

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1 understand your chart, that the NRC prioritization at
2 the end of stage 1 is probably the key step.

3 MR. CHOKSHI: Yes.

4 MEMBER ARMIJO: And if in the
5 prioritization, there are a number of plants that
6 there's no need for, literally, even doing stage 2, is
7 that possible?

8 MR. MUNSON: Yes, plants will sometimes
9 screen-out. That number is unknown right now because,
10 you know, we're still evaluating the new ground motion
11 and everything now.

12 MEMBER ARMIJO: Yes. But then you'll have
13 to say, what are the criteria for saying these are the
14 ones, you don't have to do anything else; these are
15 the one, you ought to do a little bit; and these are
16 the ones, you've got big problems.

17 MR. CHOKSHI: Yes. Cliff showed that,
18 remember, those three outcomes, you know, and that
19 will dictate, you know, which plants have to do, and
20 also, it will dictate the priority, and I think I'll
21 touch on that when we come to the next --

22 MR. MUNSON: Just fair to say that,
23 obviously, for those plants that screen-in that, the
24 greater the deviation of the new predicted ground
25 motion from the SSC, those with, you know, highest

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1 probability of having a very large impact will go
2 first.

3 MR. CHOKSHI: So now, this is, you know,
4 what I described was originally the approach outlined
5 in the 50.54(f). The industry has come up with a
6 modification too. Why don't you go to the next slide?
7 They will meet all of what is outlined in the
8 50.54(f), you know, in terms of doing the hazard
9 evaluations and the risk evaluations for the plant
10 which are spending, but then they are also
11 incorporated an interim step, which is doing an
12 expedited review of a selected system, and has been
13 shown here, looking at the FLEX phase 1 installed
14 plant equipment, you know, which is to cope with a
15 station blackout and loss of ultimate heatsink.

16 They will do interim evaluations as soon
17 as the ground motions are computed to make sure that
18 if there is need for a modification, they will do that
19 as soon as possible. And our target is to do that by
20 2016 and it might go beyond, depending on if some of
21 them have to be done in the outage. But the goal is
22 to at least look at the FLEX phase 1, you know, while
23 the PRAs are out and those are being performed. So at
24 least there is some plans in additional coping
25 capability, because this process, it's a long process.

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1 So the idea was to at least get some
2 upgrades in the plant. Okay. So, you know, and as
3 shown here, that will be limited to the FLEX phase 1,
4 basically, you know, this is all station blackout, the
5 steam-driven systems, and it will look at the
6 components. Next slide. Okay. Here is the, you
7 know, what does that consist of?

8 It's, as I mentioned, the coping with the
9 loss of AC power and it will look at the RCIC and AFW,
10 and then the associated supports, and equipment. The
11 focus will be on to the seismic capacities of this to
12 make sure that, you know, the plant can cope with
13 that. And the approach the industry has come up with,
14 I would say they are selecting the reviewable ground
15 motion, this is generally higher than GMRS, so I think
16 there is, actually, a conservatism to make sure that
17 you're looking at a higher level of ground motion, and
18 those will be modified.

19 Now, you know, the components which are
20 found, they can't show that high confidence, low
21 probability of capacity, they'll be modified. The
22 industry has developed a guidance for these, you know,
23 on this, and that guidance, we have been discussing.
24 There have been three public meetings and let me go to
25 the next slide. That just gave me, yesterday, the

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1 guidance is now here for the final endorsement, or the
2 staff endorsement, and it deals with this interim
3 evaluation.

4 Now, in doing this, because now this is an
5 ELES step and this is the same group of people who do
6 the PRA who will do the DC evaluations, it stretches
7 out the risk evaluation schedule by a year, overall.
8 I won't go in detail because I think that, very soon,
9 we're still working through all of those details, but
10 industry also has, along with this letter, with the
11 augmented guide, they have submitted two other pieces
12 that intend to use the new ground motion model,
13 continue with the update, which will stretch the --
14 Cliff showed that the submittal of the hazard results
15 by six months.

16 And it will stretch the PRA schedules,
17 roughly, by a year. Now, the thing is that, again,
18 you know, one unknown in this, how many plants wind up
19 into that second. That might effect the final
20 schedule, but right now, that's the, you know -- and
21 it says the industry to formally submit, but it's
22 here. And I think the path forward is for us to now
23 work through our endorsement process and, you know,
24 again, keeping management, you know, all of the things
25 we have to go through to get there, management

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1 consensus on that.

2 MEMBER RAY: Nilesh, when you're talking
3 about schedule, you're talking about Central and
4 Eastern schedule, right?

5 MR. CHOKSHI: Yes. And that's what --
6 now, the PRAs, you know, Central and Eastern, you are
7 right. It's important.

8 MEMBER RAY: It is in the sense that, does
9 this alternative approach do nothing more than alter
10 the schedule, the ultimate outcome remains the same?

11 MR. CHOKSHI: Exactly. That's why.
12 Because it still does everything the 50.54(f) asked.

13 MEMBER STETKAR: But other than a delaying
14 tactic, what technical benefit accrues from this?

15 MEMBER RAY: That's a pejorative.

16 MEMBER STETKAR: And as a subcommittee
17 member, I'm allowed my pejoratives.

18 MEMBER RAY: I was trying to get there
19 more slowly.

20 MEMBER STETKAR: That's okay. We're
21 running out of time.

22 MS. KAMMERER: Okay. So in the 50.54(f)
23 letter, it talks about the fact that, in some cases,
24 interim actions may be undertaken, but there was no
25 real clarity in terms of what that meant. So what

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1 industry has come in with is proposing a program,
2 which we did not immediately have, which is to look at
3 all the FLEX 1 equipment as soon as the hazard come
4 in, and compare the capacity of the FLEX equipment
5 against the new ground motions, because currently,
6 it's against the design basis.

7 And to say that if that equipment can't be
8 shown to meet the new ground motions, that
9 modifications will be made in the short-term. So what
10 we're getting out of this, which actually, I think is
11 very substantial, is plant modifications to assure
12 that that coping capacity is there to the new ground
13 motions, happening before we would ever be doing any
14 modifications resulting from the PRAs that would come
15 in.

16 And that would happen 2018, so we'd get
17 the reports -- 2016, and then some of it would have to
18 be performed during an outage.

19 MEMBER RAY: But the concern is that it
20 would be in lieu of rather than --

21 MS. KAMMERER: No, no, no.

22 MEMBER RAY: I know. The words interim
23 are clear here, and it is, I think, as you say, has a
24 benefit, at least as we're understanding it at this
25 point, because the gap between having this exceedance

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1 and doing something about it is so long, it's going to
2 be a target for challenge and I think this is
3 something that seems to speak to that.

4 MR. CHOKSHI: Exactly. Because, you know,
5 if you look at the 50.54(f), we really don't talk
6 about when, actually, we are going to do plant
7 modifications because it depends on phase 2. This
8 gives something concrete interim.

9 MEMBER RAY: As long as it doesn't become
10 a substitute for getting to the endpoint, ultimately.

11 MR. CHOKSHI: No, and the industry letter
12 is very clear on that, you know, along with the
13 schedule, so that, you know, what are they going to
14 do? So I think you are absolutely -- that first one
15 we heard, that we wanted to make sure that this does
16 not replace this.

17 MEMBER BLEY: So is the FLEX equipment
18 onsite? I thought it was going to come from
19 elsewhere.

20 MR. CHOKSHI: No, there are three phases,
21 right? Phase 1, phase 2, phase 3. Phase 1 is, they
22 install the equipment.

23 MEMBER RAY: Okay.

24 MR. CHOKSHI: And what this -- actually,
25 I shouldn't say that. What this thing is going to

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1 look at, not only the phase 1 installed equipment, but
2 all the hookup for the phase 2 and phase 3. So the
3 phase 1, station blackout, is going to vary from plant
4 to plant at the time you cope with that. So to make
5 sure that you have an extended coping capability, they
6 are going to look at all of those pieces also. So if
7 I need to, say, for example, I have installed a
8 particular, you know, thing in order to be able to
9 hook my portable equipment, that would be part of the
10 assessment.

11 → MS. KAMMERER: I think we need to make
12 sure that you guys get a copy of what was submitted
13 yesterday so that you can read it because it's got a
14 lot of information. As Nilesh said, we've had a whole
15 series of public meetings on this and we've provided
16 sets of comments, at least twice, that they have been
17 incorporated. They, basically, incorporated all of
18 our comments.

19 MEMBER BLEY: Did they? So you're pretty
20 happy with it.

21 MS. KAMMERER: I am, because I feel like
22 it's a win/win, because we're getting mods early and
23 we knew we always were going to have challenges on
24 both sides in terms of resources and this is a
25 rational way to get something early, but also, give

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1 the PRAs sufficient time that we get quality products
2 in.

3 → MR. CHOKSHI: Yes, another thing is, it's
4 not a substitute for PRA, for many reasons, because
5 this is looking at, you know, the coping capability
6 with a blackout and, you know, we need to look
7 everything else.

8 MEMBER STETKAR: That's a bit of my
9 concern is that, some of the full scope PRAs that have
10 been done, surprisingly enough, station blackout isn't
11 necessarily the most important seismic contributor.
12 And if we get tunneled into this notion that station
13 blackout is the only seismic issue, there could be
14 surprises later.

15 MR. CHOKSHI: Exactly. And that's the
16 reason I think, you know, that we -- but I think many
17 questions, you know, the balance between prevention,
18 integration, defense-in-depth, unless you do the PRA,
19 you're not going to get those answer, you know? So we
20 have to. You know, it fills the gap. You know,
21 that's why it's an interim action.

22 MEMBER STETKAR: The reason for my
23 pejorative comment was to make sure that I was hearing
24 some feedback that there is actual technical value
25 added and I've got some assurance of that.

1 MS. REGNER: We probably need to add just
2 a clarification just for full disclosure and that it's
3 not all FLEX 1, it's not all of the coping equipment,
4 it's a subset of the coping equipment. I just want to
5 make sure that was clear, and it's also not all phase
6 2 connections, it's one set, so it's a subset. It's
7 significant subset, but it is a subset of that entire
8 range of --

9 MEMBER STETKAR: Those caveats are
10 described in whatever was submitted yesterday?

11 MS. REGNER: Yes.

12 MEMBER BLEY: But the subset is one that
13 if the things in the subset worked, you're okay.

14 MS. REGNER: Right. Is that what you
15 wanted to say, Kimberly?

16 MS. KEITHLINE: No, this is Kimberly
17 Keithline from NEI. I wanted to point out, because I
18 think this will help alleviate one concern, I know the
19 slides say alternative approach. We, in industry, are
20 not calling it alternative approach. We've been very
21 careful to refer to our overall approach as an
22 augmented approach because we are going to do what was
23 requested in the 50.54(f) letter and we decided it was
24 prudent to add this deterministic expedited evaluation
25 that will result in an earlier demonstration of

1 additional seismic margin and some plant modifications
2 that will enhance safety.

3 And so we've been careful among ourselves
4 not to let the utilities think that this is an
5 alternative, an option, that they can choose to just
6 go do instead of what you requested.

7 MR. CHOKSHI: I would like to, this is,
8 you know, again, how the words create, you know,
9 because for some reason, augmented has not played real
10 well with us inside the agency, and now the
11 alternative is not playing well.

12 MEMBER RAY: That was a good clarification
13 she gave.

14 MEMBER BROWN: Okay. Can you go back to
15 Slide 34? I just want to make sure I understand how
16 Harold's start integrates into here. After reading
17 these two slides, it seems to me that, forget about
18 what you call it, the industry approach is in the
19 stage 1, between where they finish their updated GMM
20 and you're all doing your screening, they stick this
21 in there and start evaluating what they may do in some
22 circumstances while you continue the screening and
23 prioritization in accordance with this game plan.

24 MR. CHOKSHI: Right. And that's what that
25 light-blue box in the chart.

1 MEMBER BROWN: Yes, I know. But this
2 comes in right after they -- well, but that's just
3 hazard re-evaluations. That's not the interim. It's
4 all part of that -- it follows that. Once they get
5 the new GMMS, then they will go in and do this
6 relative in whatever this abbreviated, or subset, of
7 phase 1 of their FLEX phase 1 and phase 2.

8 So, to me, based on that understanding, I
9 didn't view this as a delay, it seems to me, really
10 improving the process in getting some stuff done
11 early, as opposed to waiting till 2018, or whatever
12 the heck it is. So it seems to me that the industry
13 was proposing -- and I'm trying to be non-pejorative
14 relative to a delaying tactic. I think this was a
15 positive thing.

16 MR. CHOKSHI: We see value, you know. I
17 think, you know, this does stretch up one year, but I
18 think there are two things. First off, some plants
19 will have made some modifications which will actually
20 increases capacity. Second thing is that, the
21 resources will be better utilized and I think that
22 will probably result in better quality, ultimate, you
23 know, PRA story.

24 MS. KAMMERER: And for those that aren't
25 making mods, we'll have a better assurance of that

1 defense-in-depth capacity that's demonstrated to the
2 higher ground motions.

3 MR. WIDMAYER: Hey, Niles. I remember
4 during some early parts of the discussion of this, I
5 think you had a discussion with industry about whether
6 or not the FLEX equipment needed to have
7 qualifications, what kind of qualifications the FLEX
8 equipment was -- have you guys ironed that particular
9 issue out?

10 MR. CHOKSHI: Yes, the way they are going
11 to do is, the evaluation is, using, basically, that
12 process we used for the seismic margin evaluation,
13 there is an EPRI guidance document, they have to
14 follow that, and that talks about, how do we evaluate
15 the capacities of the equipment? A lot of this
16 equipment was installed equipment.

17 MS. KEITHLINE: This is Kimberly Keithline
18 again. I know there have been discussions related to
19 this effort, but there are different discussions that
20 have occurred related to the FLEX effort, the response
21 to the orders for Recommendation 4.2, where part of
22 that response will involve temporary portable
23 equipment, and there have been discussions about what
24 level of qualification that equipment needs to have.
25 That equipment is different from this effort.

1 We're looking at the installed parts of
2 the plant here. So we're not changing what's being
3 done over there, so our seismic margin assessment
4 approach that we're doing here does not effect the
5 temporary portable equipment.

6 MS. KAMMERER: This is like a classic
7 demonstration of seismic margin.

8 CHAIRMAN SCHULTZ: Nilesh, can we shift
9 back to 37; Slide 37?

10 MR. CHOKSHI: Okay.

11 CHAIRMAN SCHULTZ: And I just wanted to
12 clarify, the letter that has been received, is that
13 the second bullet; the formal submittal?

14 MR. CHOKSHI: Yes. So the letter contains
15 three pieces of information. One is their plan to
16 continue with the ground motion model. Second is this
17 approach with the A-word, and its overall schedule,
18 how does that, you know, effect the schedule? So this
19 really ties-in all the pieces.

20 MEMBER STETKAR: Well, I guess we'll see
21 that. What I'm struggling with is words like, a year
22 here, a year there, a zillion here, a billion there.

23 MS. KAMMERER: It's all laid out in the
24 attachment, which is the schedule; the specific
25 schedule.

1 MEMBER STETKAR: Well, I heard, you know,
2 some rationale for a delay of around six months in the
3 ground motion response spectra. I'm curious why this
4 other additional analysis, you know, then adds another
5 six months on to the end of that, for example, but I
6 guess we'll see it in the --

7 MR. CHOKSHI: You know, because it's the
8 same people who will be doing PRA, will be doing this
9 interim evaluation, particularly, the structural
10 fragility people.

11 CHAIRMAN SCHULTZ: All right. That's the
12 presentation. I'd like to have an opportunity for the
13 committee to provide additional comments or questions.
14 Mike, starting with you.

15 MEMBER CORRADINI: Every time I get this
16 topic, it's an education. I will say, though, that
17 maybe we should discuss in P&P, but as we're going to
18 be getting changes in membership, I think, maybe,
19 another tutorial like we had, I can't remember, some
20 of the folks in front of us here did this for a whole
21 day a few years ago, whether it's two, three, four,
22 five years ago, I remember it.

23 But doing this again, I think, helps us
24 because we're going to have to come back to this again
25 and again as this becomes more detailed. But other

1 than that, I appreciate the staff's time.

2 CHAIRMAN SCHULTZ: We'll look for an
3 opportunity. Joy?

4 MEMBER REMPE: I also appreciate the
5 staff's time, but I have no comments.

6 CHAIRMAN SCHULTZ: Charlie?

7 MEMBER BROWN: No more comments.

8 CHAIRMAN SCHULTZ: Bill?

9 MEMBER SHACK: It was a good meeting.

10 CHAIRMAN SCHULTZ: Mike? John?

11 MEMBER STETKAR: Nothing more.

12 CHAIRMAN SCHULTZ: Sam?

13 MEMBER ARMIJO: Yes, I thought it was an
14 excellent presentation. A lot of work's been done.
15 The staff's on the right path. I like this new
16 initiative too. I see it as an augmentation or an
17 improvement over what we were going to do. In fact,
18 there could be some frustration that real hardware
19 wasn't really being upgraded when there was an
20 identified increase in the hazard, or the risk, and
21 this addresses that, and so I think that's a very
22 positive thing.

23 So, you know, these things take a lot of
24 time, but if we can go in parallel, upgrading
25 equipment where there's a benefit, I think that's a

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1 great initiative.

2 CHAIRMAN SCHULTZ: Dennis?

3 MEMBER BLEY: Nothing new to add. I, too,
4 appreciated the presentation and the staff, and I
5 think you got a great approach.

6 MR. CHOKSHI: And by the way, we have
7 answered one of the questions, we looked up, so after
8 everybody finishes --

9 CHAIRMAN SCHULTZ: Okay.

10 MR. CHOKSHI: Okay.

11 CHAIRMAN SCHULTZ: Harold?

12 MEMBER RAY: Well, we're just at the
13 beginning of a long heavy burden of work. It's
14 sequestered here, I'm told. I'm not sure how it's all
15 going to match-up with what lies ahead, but we'll see.
16 I don't think anybody can say right now, and that will
17 be my main point. It kind of echoes what Mike said,
18 which is, we're going to have a lot to look at,
19 ultimately, but this certainly a good status update.

20 CHAIRMAN SCHULTZ: Thank you. Dick?

21 MEMBER SKILLMAN: Thank you for a thorough
22 presentation. Look forward to hearing from you again.

23 CHAIRMAN SCHULTZ: Right now I'd like --
24 oh, you said you had one response?

25 MR. CHOKSHI: Yes. I think, Dr. Stetkar,

1 your question about the refueling?

2 MEMBER STETKAR: Yes. I remembered. I
3 was thinking. Thank you.

4 MS. REGNER: Yes, one of the criteria for
5 uncovering the stored fuel addresses when the pool and
6 reactor are configured for refueling, so that's one.
7 The 72 hours goes back to the walk-down guidance.

8 MR. CHOKSHI: That's true. This also came
9 from that.

10 MS. REGNER: So that's pulled from walk-
11 down guidance.

12 CHAIRMAN SCHULTZ: All right. Before I
13 close the meeting, I'd like to provide an opportunity
14 for public comments. If there are members of the
15 public in the audience here in the meeting room, if
16 one would like to make a comment. Seeing none, we
17 have the bridge line open now. Yes. And so if anyone
18 on the bridge line would like to make a comment,
19 please introduce yourself and do so.

20 Hearing none, I'll close the public
21 comment period. I would like to say, we have made
22 some points during the meeting that, Niles, you've
23 taken some notes on. Two areas, specifically, we
24 talked in response to the spent fuel pool integrity
25 evaluation, one piece of it, but we also raised the

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1 issue associated with operator action that --

2 MR. CHOKSHI: Right. There are two things
3 I have. One is the relay chatter with the spent fuel
4 pool.

5 CHAIRMAN SCHULTZ: Yes, exactly.

6 MR. CHOKSHI: And operator actions on the
7 relays to that.

8 CHAIRMAN SCHULTZ: And we talked about
9 additional interaction and I think we all noticed,
10 both the staff as well as the committee, that we are
11 in the first box of many on the chart that is well-
12 developed, so we look forward to those additional
13 interactions. And I want to thank each of you for the
14 presentations today as well as your responses to the
15 questions of the committee. It's been very valuable
16 to have the input at this point in time.

17 And we've been looking forward to it, as
18 you indicated, Nilesh, for the last several months, so
19 it's good to be able to come together and we'll look
20 forward to further interactions. So with that, I'll
21 close the meeting and thank you.

22 (Whereupon, the meeting in the above-
23 entitled matter was concluded at 11:52 a.m.)

24

25



Presentation on Seismic Evaluation Guidance and NRC Seismic Margin Assessment

April 10, 2013

Nilesh Chokshi, Dep. Dir. DSEA, NRO
Clifford Munson, Senior Advisor, DSEA, NRO
Jon Ake, Senior Seismologist, DE, RES
**Annie Kammerer, Senior Seismologist, on Detail to DSEA,
NRO**

Outline of Presentation

- Overview of Seismic Evaluation Guidance (SPID)
- NRC Seismic Margin Assessments (SMA) Guidance
- Industry Proposed Alternative Approach

SPID Overview

- **Industry developed the guidance document through interactions with the NRC**
“Seismic Evaluations Guidance: Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic,” EPRI 1025287, November 2012
- **NRC endorsed the SPID guidance on 02/15/2013 with four clarifications**

Contents of SPID

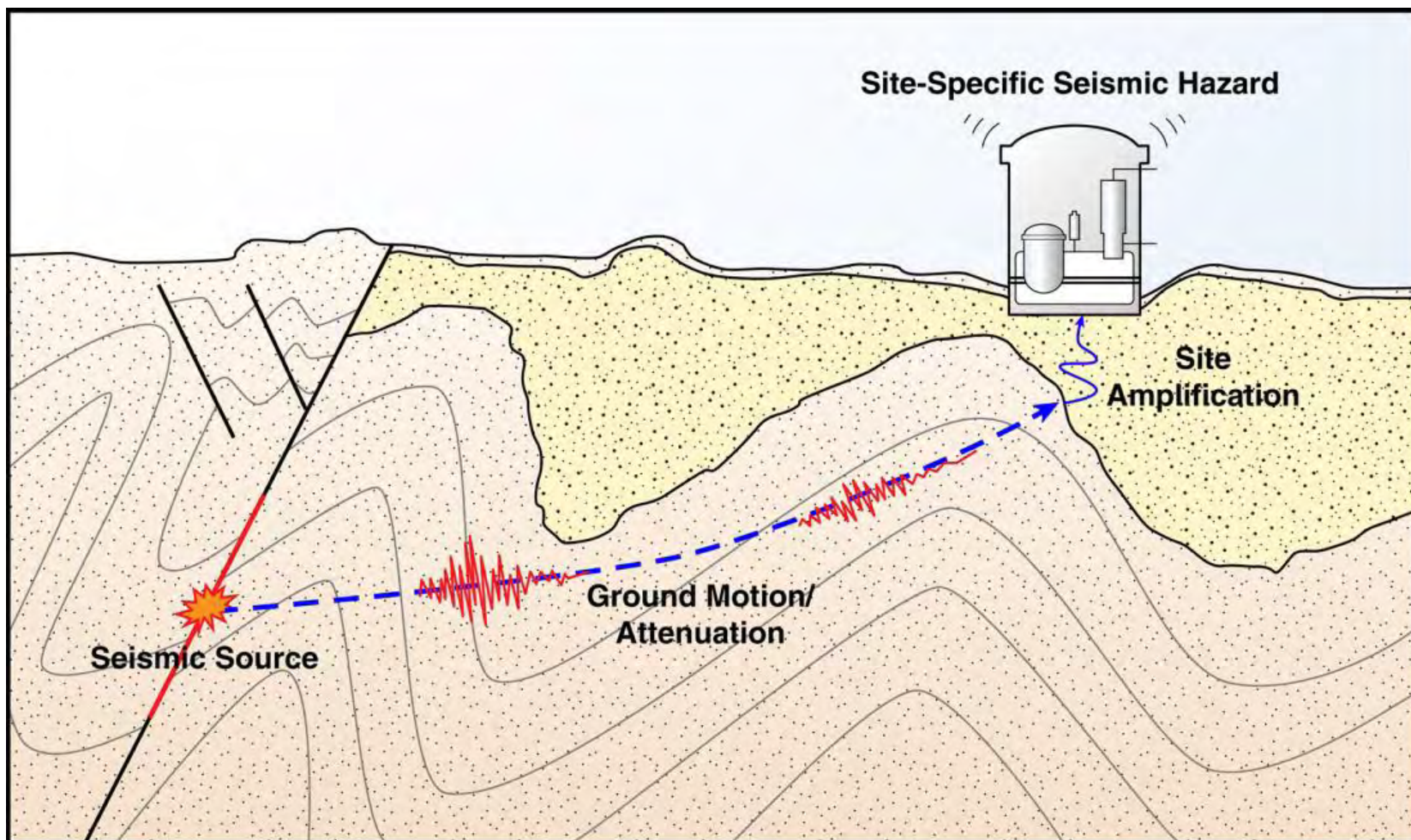
1. Purpose and Approach
2. Seismic Hazard Development
3. GMRS Comparisons and Screening of Plants
4. Seismic Hazard and Screening Report
5. Prioritization (Schedule)
6. Seismic Risk Evaluation
7. Spent Fuel Pool Evaluation

Four appendices to SPID with detailed guidance on special topics

Key SPID Positions – Hazard and Screening

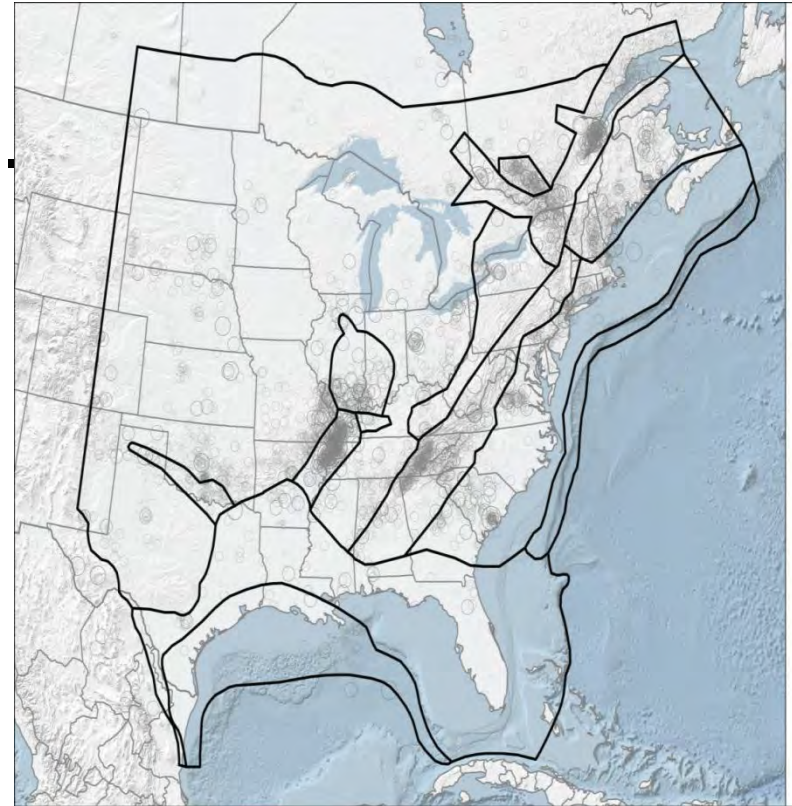
- R2.1 Seismic hazard reevaluations
 - Seismic source characterization
 - Ground motion models
 - Site amplification
- Screening of results
 - Reevaluated hazard (GMRS) vs. design basis (SSE)
 - Screening evaluation focused on 1 to 10 Hz range
 - Guidance for special cases (narrow banded exceedances and low frequency exceedances)
 - Use of IPEEE capacity for screening
 - Criteria for adequacy of the IPEEE results

Site-Specific Seismic Hazard Development



Regional and Plant Specific Approach for Development of the Site Seismic Hazard (CEUS)

- **CEUS plants will use the latest regional models for seismic source characterization-CEUS Seismic Source Characterization Model (NUREG 2115, 2012)**
- **EPRI 2004/2006 regional ground motion model for the CEUS was identified in the 50.54(f) letter. Update in progress.**
- **These regional models will be used to develop the hard-rock seismic hazard at each CEUS reactor location**



CEUS EPRI Ground Motion Model (GMM)

Background

- Staff has previously endorsed EPRI (2004, 2006) CEUS GMM and specified its use in 50.54(f) letter
- Industry is proceeding with update of EPRI GMM
- Industry requested staff endorsement by end of 2/2013 in order to meet 9/2013 due date for CEUS hazard reevaluations
- Staff unable to endorse updated EPRI GMM
 - Treatment of uncertainty
 - Adequacy of documentation

CEUS EPRI

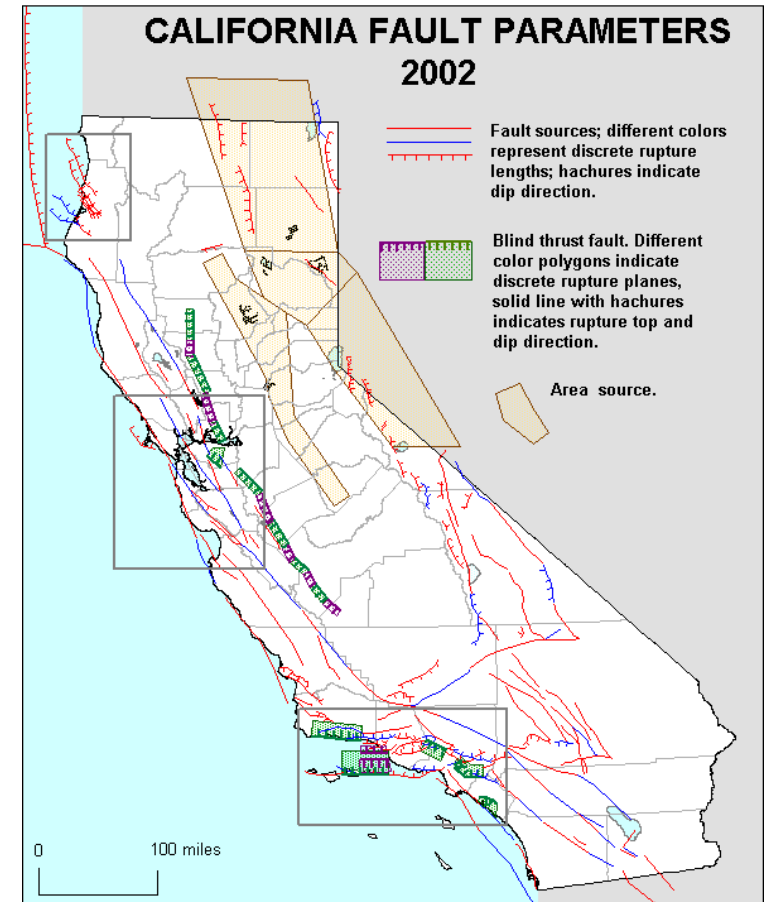
Ground Motion Model (GMM)

Current Status and Path Forward

- Industry presented updated GMM at public meeting on March 26
- Updated model appears to address issues raised by peer reviewers and staff
- Industry requested 6 month delay for CEUS hazard submittals
 - Hazard submittals moved from Sept 2013 to March 2014

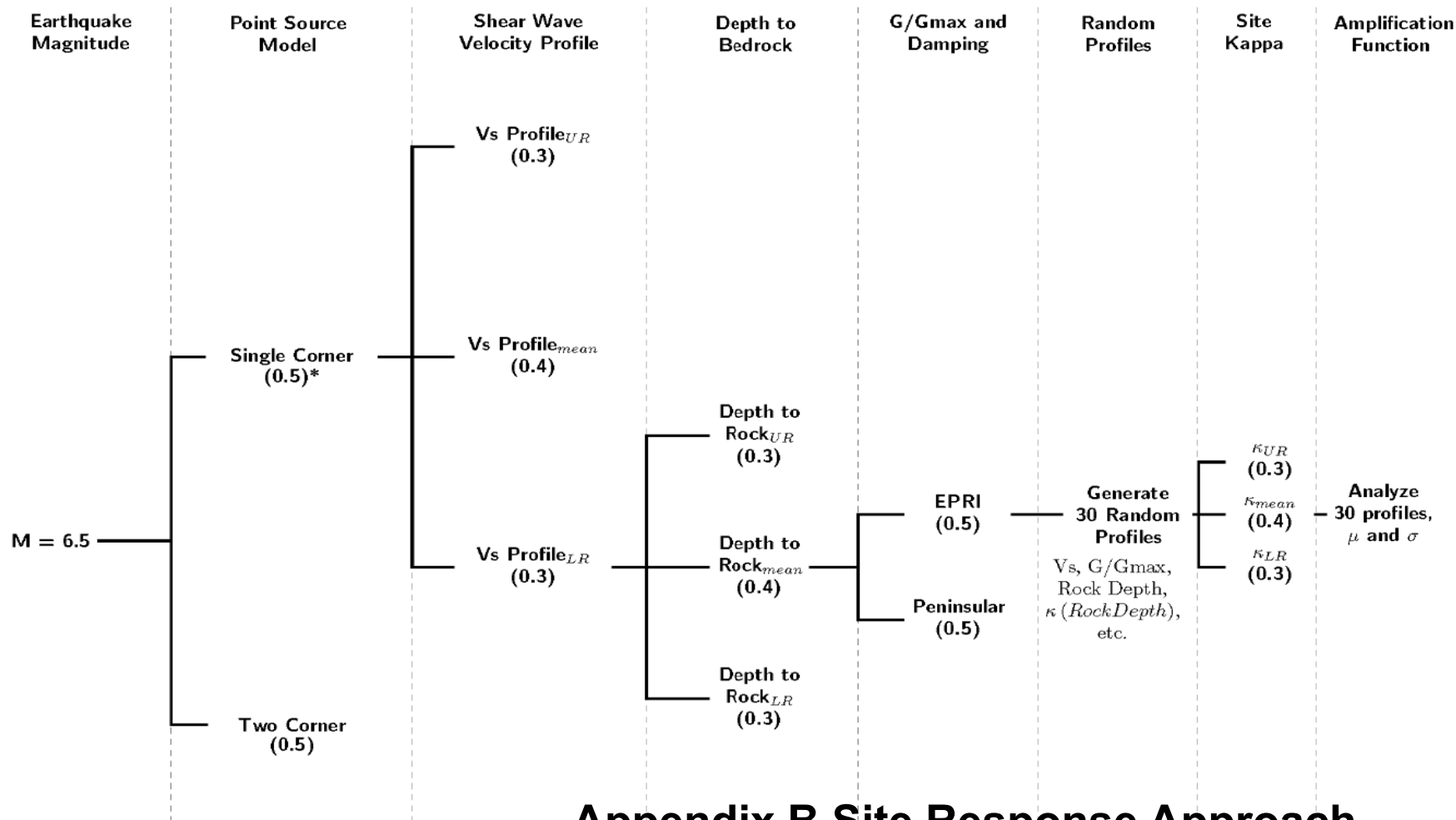
Regional and Plant Specific Approach for Development of the Site Seismic Hazard (WUS)

- **WUS characterization of seismic sources is much more site-specific.**
- **Seismic source characterization is being done on a site-specific basis following a SSHAC Level 3 process**
- **More data is available to develop ground motion models**
- **A regional ground motion model being developed for Diablo Canyon, San Onofre and Palo Verde and a “site-specific” study for Columbia (jointly with the DOE Hanford site)**



Site Response Evaluation

- For sites not founded on hard rock- an evaluation of the amplification that may occur is necessary
- For each site
 - Layering of soil and/or soft rock
 - Thicknesses of layers
 - Shear wave velocity and densities
 - Nonlinear properties of the soil
 - Uncertainties
- As each site varies in available data Appendix B of the SPID outlines a process to estimate site response amplification including the uncertainties

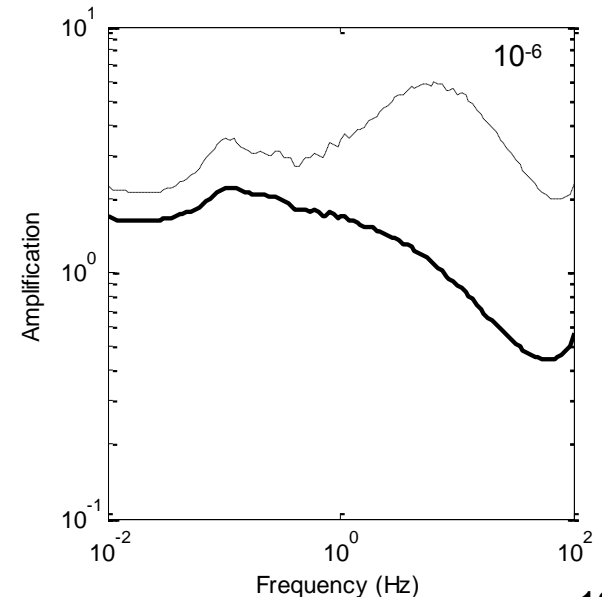
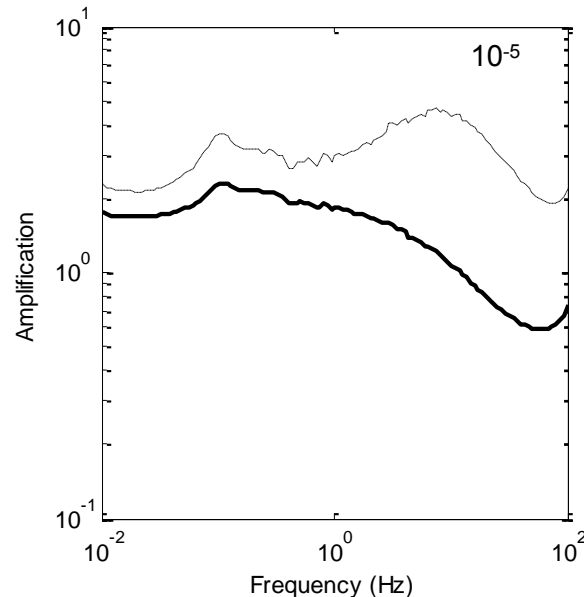
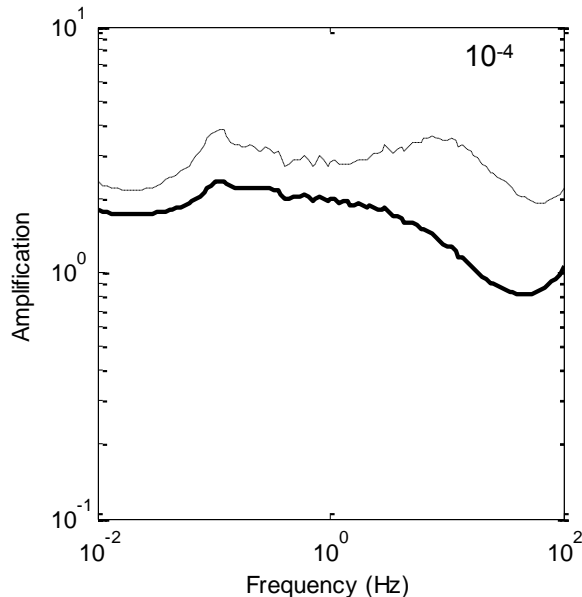


Appendix B Site Response Approach

* Assigned weight

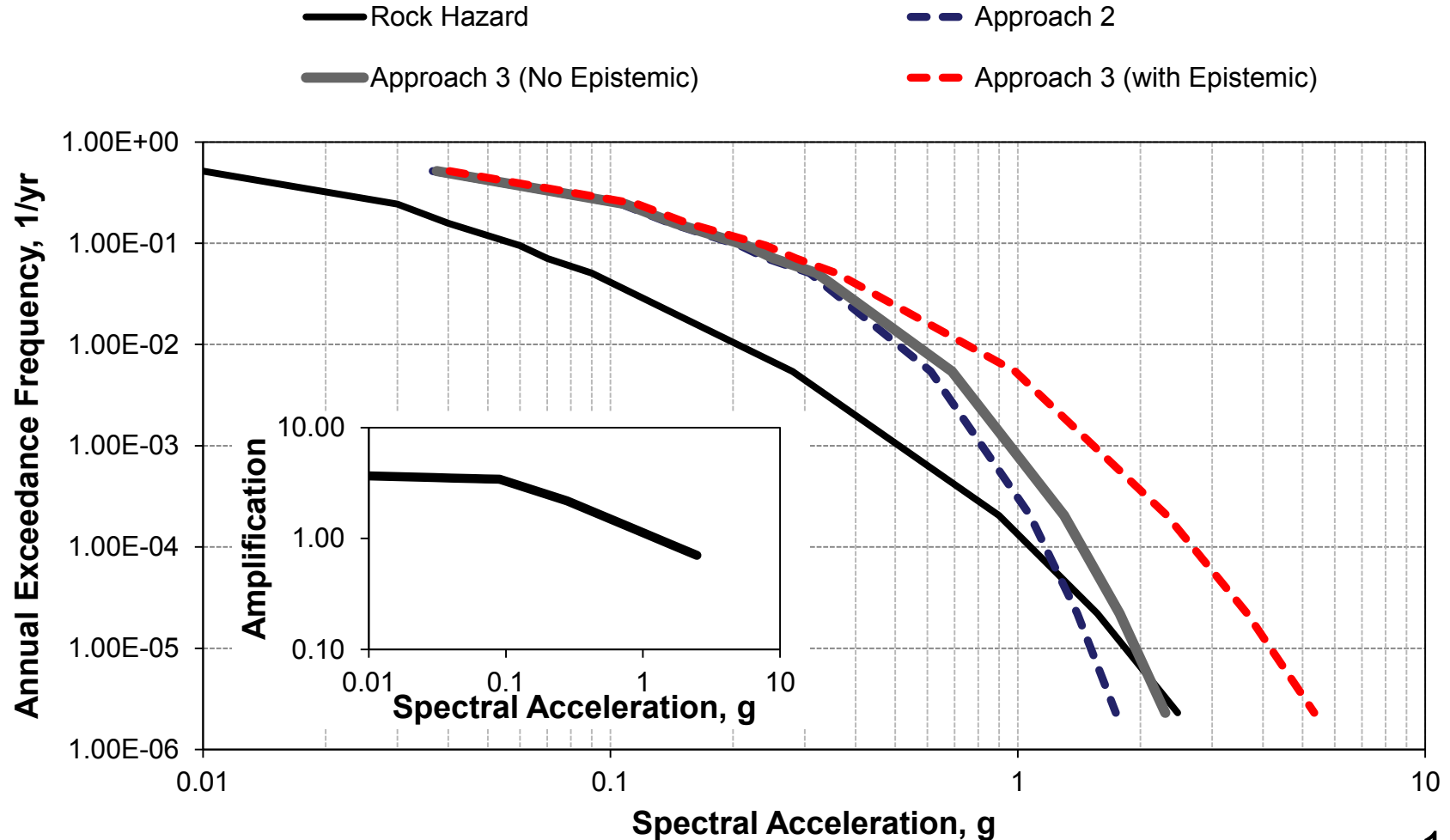
Uncertainty in Amplification Functions

- Appendix B attempts to capture uncertainty in site amplification as a function of amount of information available and amplitude of input motions
- This uncertainty translates into changes in predicted soil hazard.



Effect of Uncertainty on Soil Hazard

1 Hz Hazard Curve



SPID Non-Concurrence Issues

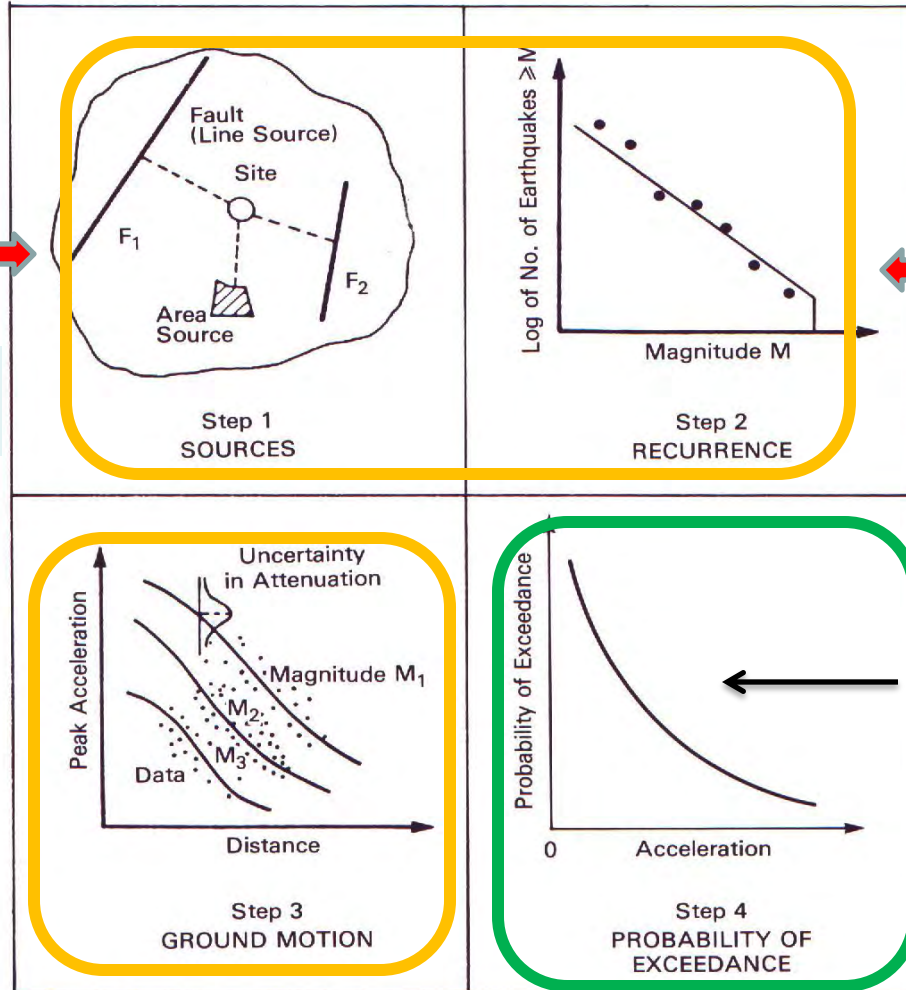
- Consistency between NUREG 2115 and SPID
 - NUREG calls for potential site-specific adjustments
 - *CEUS-SSC is refined & up-to-date source model*
- SPID constraints on source distances
 - SPID constrains applicable sources for hazard characterization
 - 320 km for background sources
 - 1000 km for large repeating sources
 - *Distance constraints do not exclude significant sources*
- New site investigations not called for in SPID
 - further geologic and geotechnical investigations
 - *SPID relies on existing site characterizations and emphasizes uncertainty in site response*

Probabilistic Seismic Hazard Analysis for GMRS

Seismic Source Characterization Model

Seismic Sources
Magnitudes & Locations

Ground Motion Model



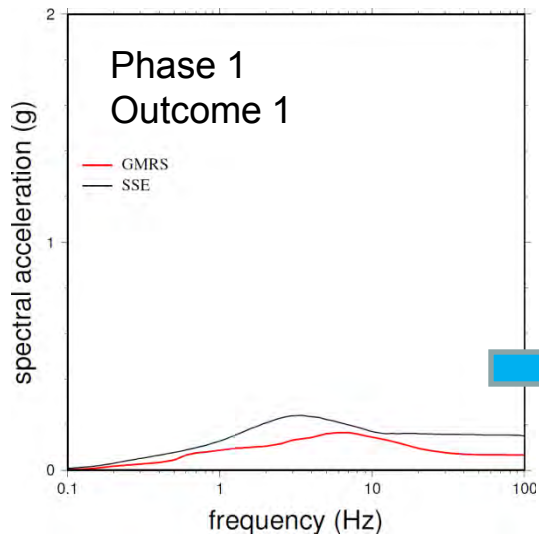
Earthquake
Recurrence

Seismic Hazard
Curves

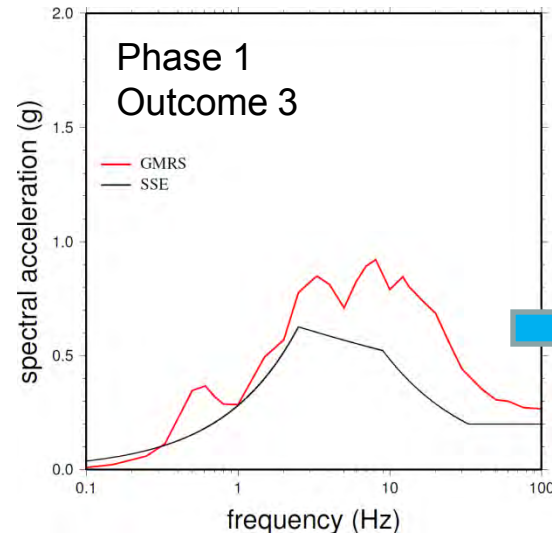
Local Site Response

GMRS

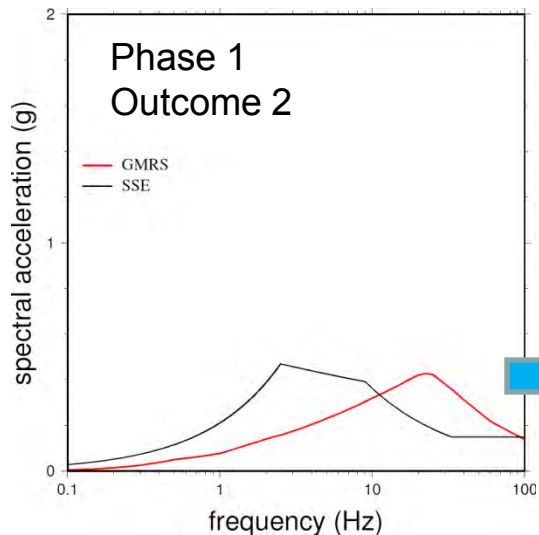
Screening – GMRS to SSE Comparisons



No Further Analysis

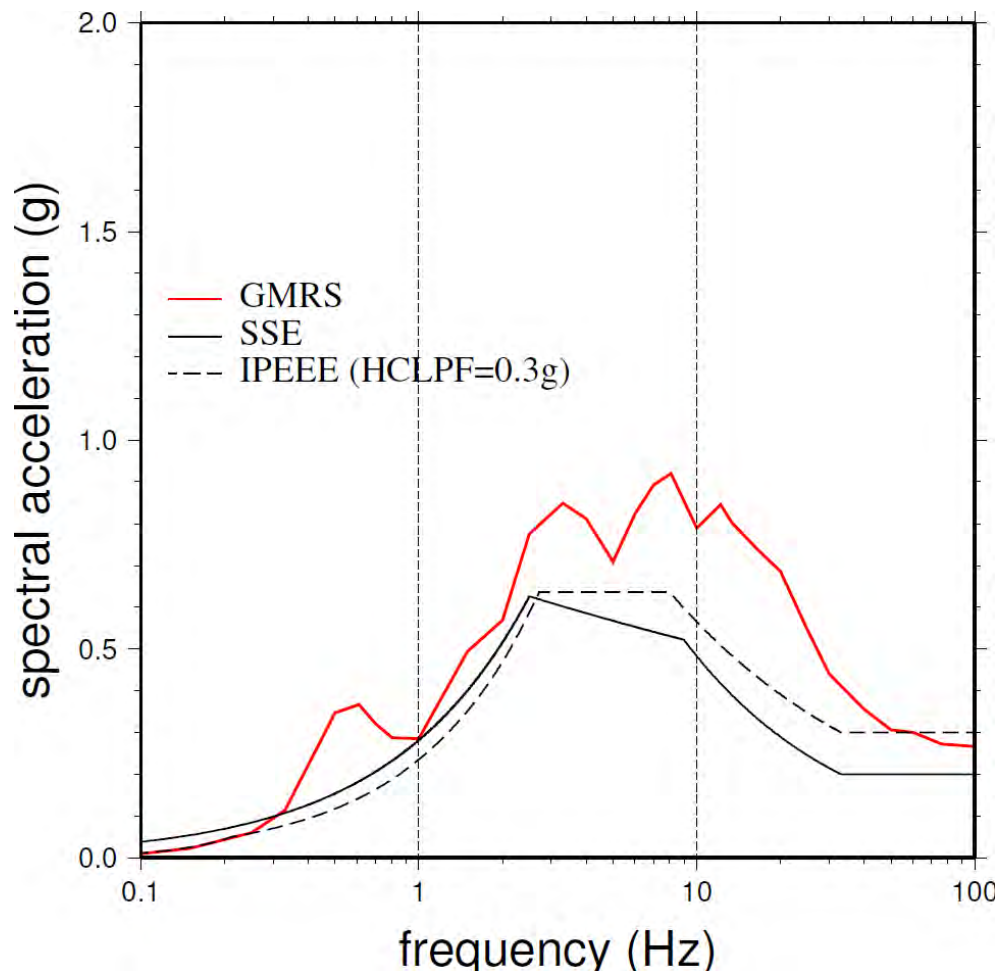


Plant Risk
Evaluation
Needed (SPRA)



Industry Testing Program for High Frequency
Sensitive components

Screening – Use of IPEEE Results



Applicability

IPEEE SPRAs

IPEEE SMAs (Full & Focused)

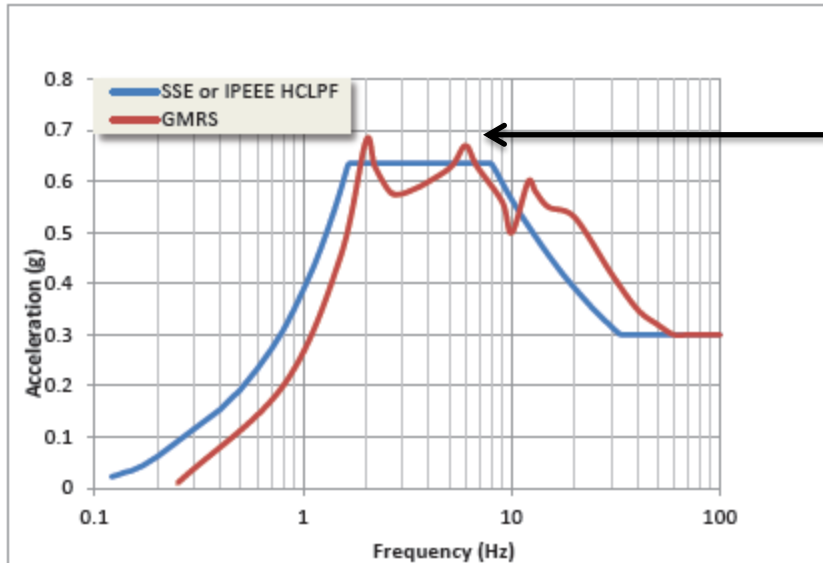
~~Reduced Scope~~

Enhance Focused to Full

Requirements

- IPEEE Commitments
- IPEEE Modifications
- Deficiencies from SER
- Adequacy of
 - Structural models
 - Selection of equipment
 - Screening
 - Walkdowns
 - Peer review
 - Fragility/System modeling

Screening – Other Considerations

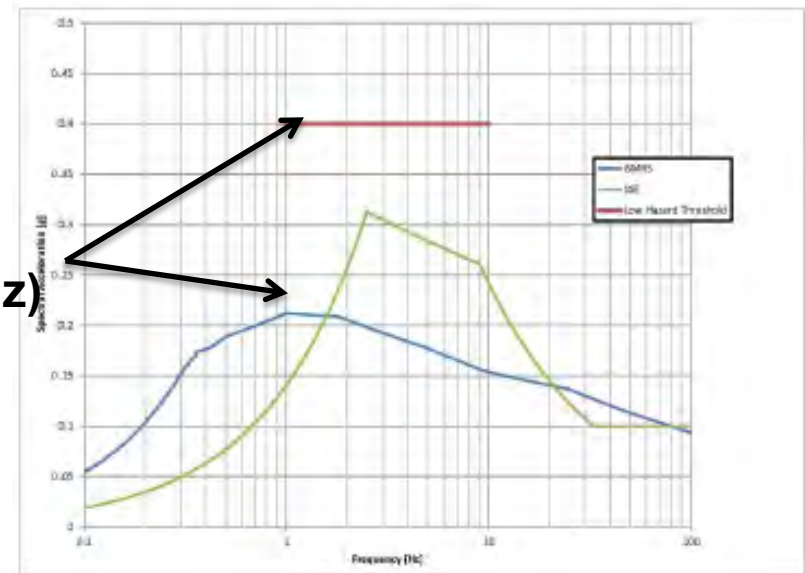


Narrow Band Exceedance

- Up to 10% over limited range
- SPRA or SMA not needed

GMRS below Low Hazard Threshold & Low Frequency Exceedance (<2.5Hz)

- SPRA or SMA not needed
- Identify susceptible SSCs
- Determine HCLPF capacities



Key SPID Positions –Structural and SSI Response

- Structural modeling
 - Facilitate use of existing models when appropriate
 - Criteria against which existing models should be reviewed
- Seismic response scaling
 - Previously developed in-structure response spectra (ISRS)
 - Shapes of the previously used spectra vs. reevaluated spectra
 - Structural natural frequencies, mode shapes, and participation factors
- Fixed-based analysis criteria for sites previously defined as “rock”

Key SPID Positions – Fragility/Capacity Calculations

- Hybrid approach for fragilities - Facilitate use of CDFM approach
- Dominant risk contributors also evaluated using fragility approach

Type SSC	Composite β_c	Random β_R	Uncertainty β_u	$C_{50\%}/C_{1\%}$
Structures & Major Passive Mech. Components Mounted on Ground or at Low Elevation	0.35	0.24	0.26	2.26
Active Components Mounted at High Elevation	0.45	0.24	0.38	2.85
Other SSCs	0.40	0.24	0.32	2.54

Key SPID Positions – High Frequency Test Program

- Industry has undertaken a test program to evaluate the capacities of high-frequency sensitive components
- Plants where reevaluated hazard is predominantly in the high-frequency range (>10 Hz) will reference test results
- Test program is divided into two phases

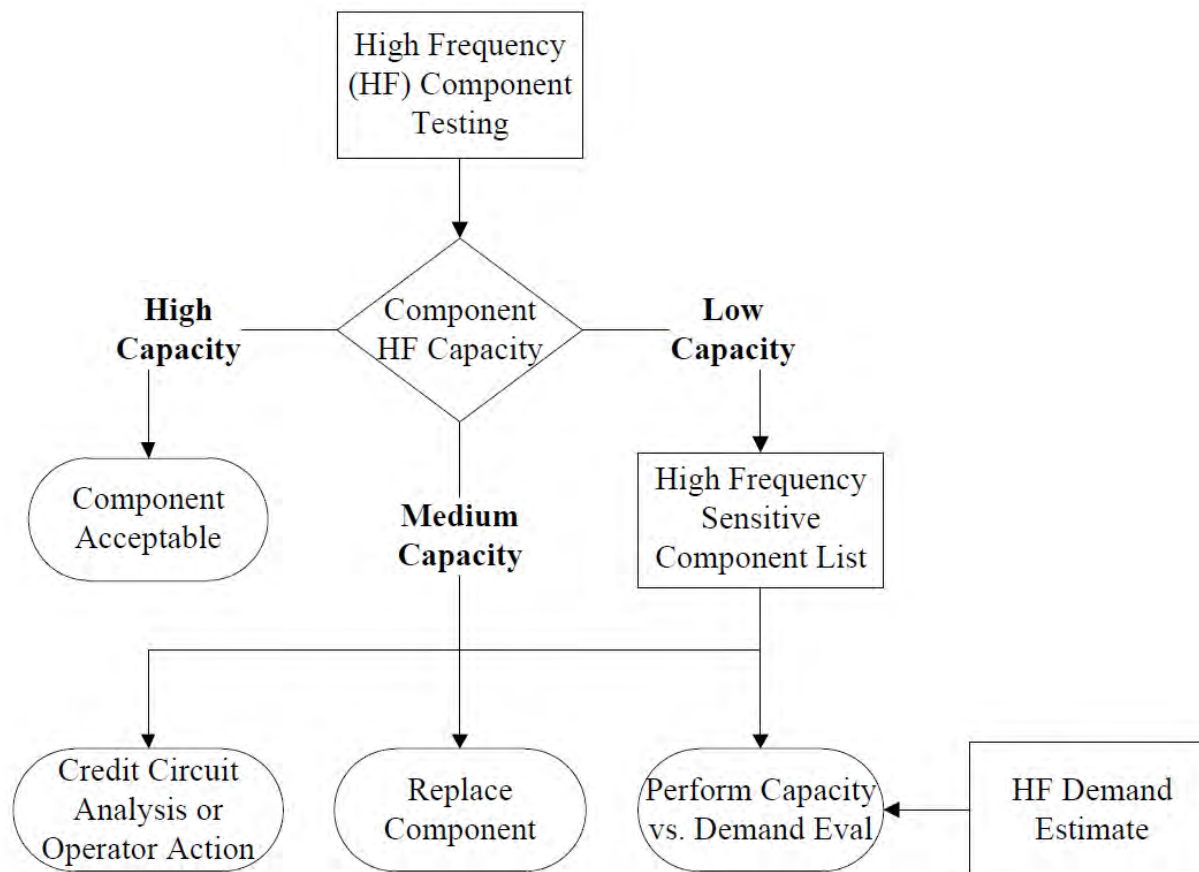
High Frequency Test Program: Phase 1

- Phase 1 was conducted as a pilot effort to develop testing protocols for expanded Phase 2 program
- Representative sample of components selected for Phase 1
- Focus was in the 20 to 40 Hz range using different types of input motions
- Amplitude increased until equipment failed acceptance criteria

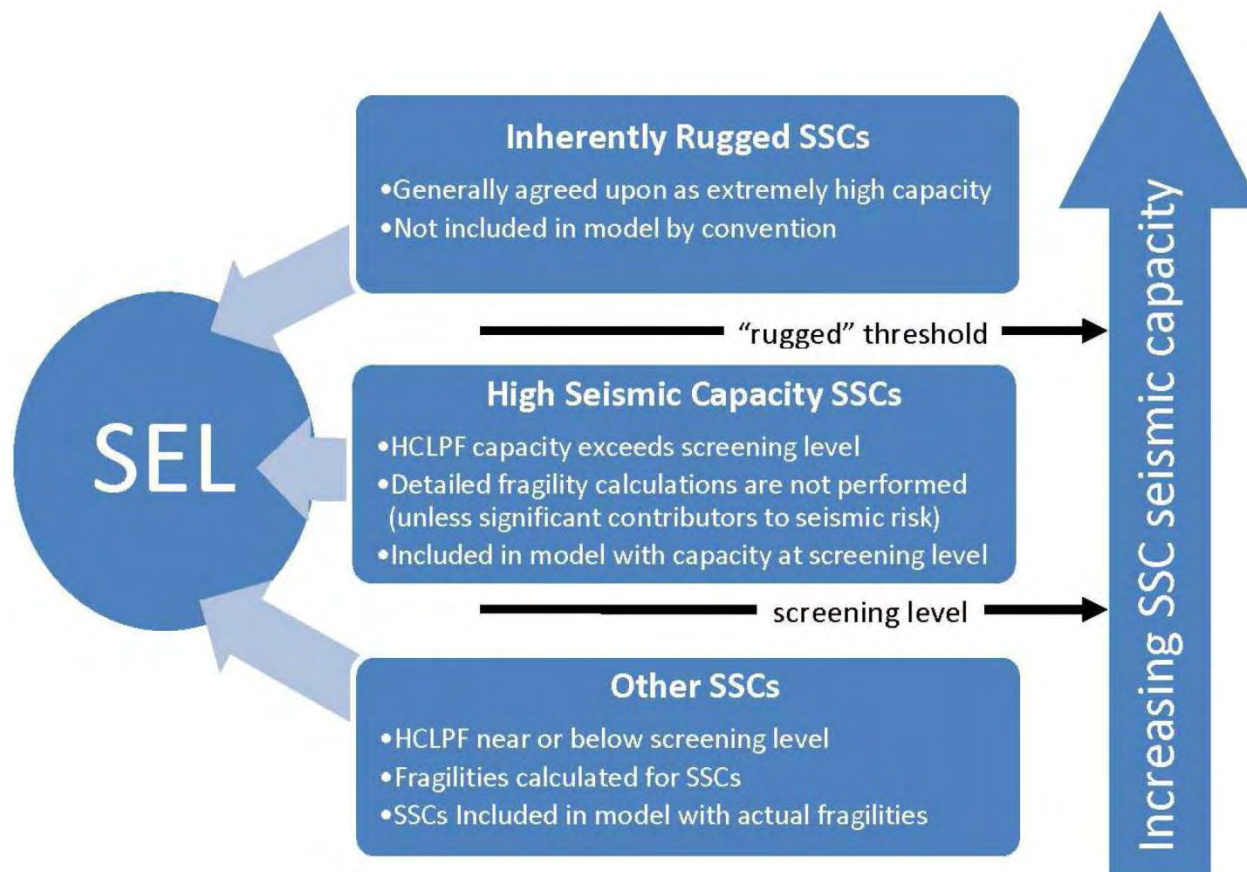
High Frequency Test Program: Phase 2

- Phase 2 will test an expanded sample of high-frequency sensitive components
 - Distribution of manufactures
 - Variety of contact mechanical motions and physical forms
- Phase 2 test results will be used to confirm the adequacy of components subjected to high frequency input motions
 - Plants with only high-frequency GMRS
 - Plants performing risk evaluations

High Frequency Component Screening



Key SPID Position – Capacity Based SSC Selection



Key SPID Position – Capacity Based SSC Selection

- Components identified as “high capacity” SSCs are assigned capacities equal to the screening level and retained in the system model
- Screening level may be set as either
 - Level consistent with a HCLPF capacity that is 2.5 times the GMRS or
 - Level equivalent to the HCLPF that leads to a frequency of failure on the order of $5 \times 10^{-7}/\text{yr}$ using a mean point estimate
- After performing the analysis a check must be conducted to assure that the screening level was not too low

Key SPID Positions - Additional Guidance

- Large Early Release Frequency (LERF)
- Comparison to ASME/ANS SPRA Standard
- Peer Review
- SPRA Documentation
- Spent Fuel Pool Integrity Evaluation

Comparison to ASME/ANS SPRA Standard

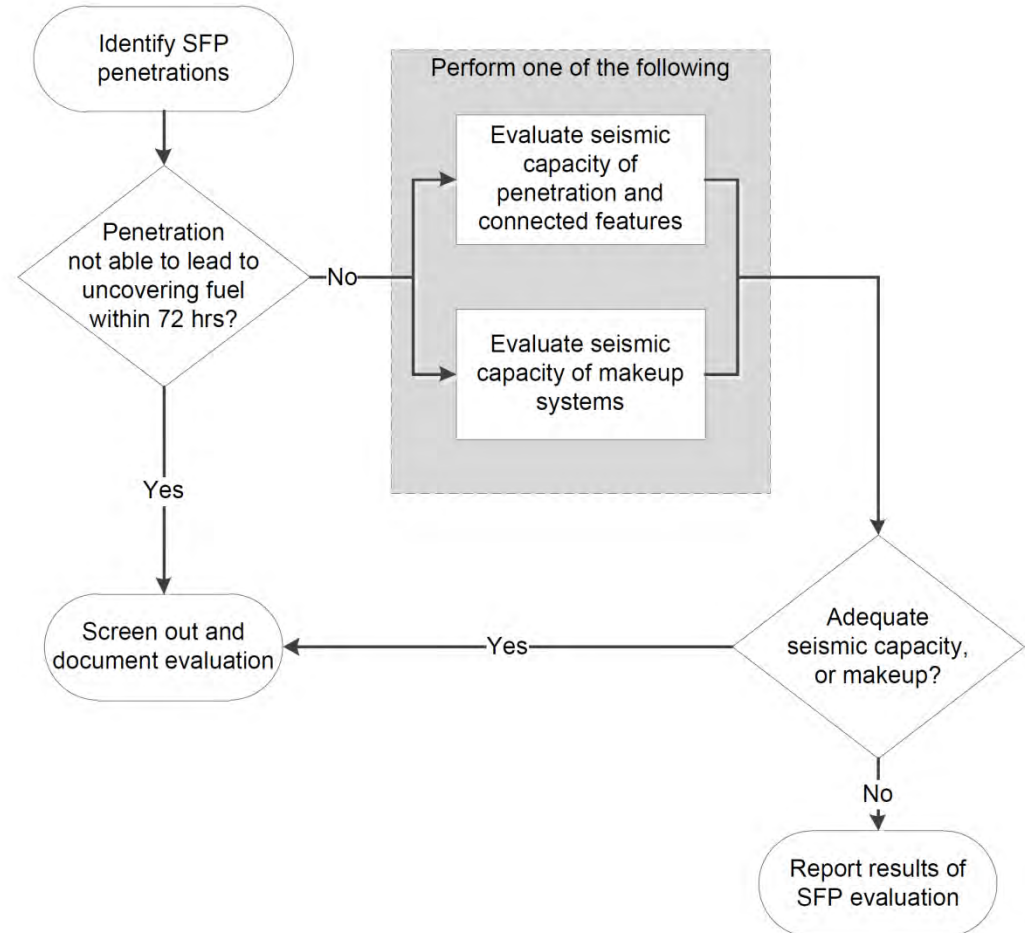
Standard Element	Requirements from Addendum A	Requirements from Addendum B	Relevant Intent of Guidance in SPID
HLR-SFR-E	The seismic-fragility evaluation shall incorporate the findings of a detailed walkdown of the plant focusing on the anchorage, lateral seismic support, and potential systems interactions.		
SFR-E1	CONDUCT a detailed walkdown of the plant, focusing on equipment anchorage, lateral seismic support, spatial interactions and potential systems interactions (both structural and functional interactions). <i>CC I-II-III</i>	CONDUCT a detailed walkdown of the plant, focusing on equipment anchorage, lateral seismic support, spatial interactions and potential systems interactions (both structural and functional interactions). <i>CC H-III</i>	No change in Addendum B. This consideration is not addressed explicitly in the SPID.
SFR-E2	DOCUMENT the walkdown procedures, walkdown team composition and its members' qualifications, walkdown observations, and conclusions. <i>CC I-II-III</i>	DOCUMENT the walkdown procedures, walkdown team composition and its members' qualifications, walkdown observations, and conclusions. <i>CC H-III</i>	No change in Addendum B. This consideration is not addressed explicitly in the SPID.
SFR-E3	If components are screened out during or following the walkdown, DOCUMENT any anchorage calculations and PROVIDE the basis justifying such a screening. <i>CC I-II-III</i>	If components are screened out during or following the walkdown, DOCUMENT the basis including any anchorage calculations that justify such a screening. <i>CC H-III</i>	Wording changes in Addendum B account for the need to document the basis for any screening in addition to that based on anchorage calculations. Screening during the walkdown itself is not addressed explicitly in the SPID. Note, however, that Section 6.4.3 of this document provides explicit guidance for screening SSCs recognized to be very rugged and for performing more limited fragility calculations for certain other SSCs.

Peer Review

- “In-process” peer review is acceptable
 - Reviewers need to remain independent
- Findings should be based on a consensus process
- Final review by the entire peer review team to occur at completion of the project

Spent Fuel Pool Integrity Evaluation

- Failures of elements of the SFP due to a seismic event leading to draining of the SFP
 - Previous detailed assessments of SFP structural integrity
 - Evaluation of SFP focuses on potential failure of penetrations



NRC SMA ISG

- Draft ISG issued for public comments – September 2012
- Most of the comments related to clarifications
- Final ISG (JLD-ISG-2012-04) issued – November 2012
- No significant changes, peer review section revised to reflect the latest guidance and acceptance of “in-process” review

Staff Positions on Technical Issues

SMA Scope 4.2

- Addition of certain containment functions and systems to assess LERF
- HCLPF capacities for core-damage and large early release sequences
- Separate analysis of HCLPF capacities of sequences with and sequences without non-seismic failures and human errors
- Chatter analysis and treatment of high-frequency response of certain SSCs

Ground Motion and In-Structure Response 4.3

- Selection of the Review Level Earthquake
- Soil failures
- Development of in-structure response spectra
- Median seismic responses of systems and components

Systems Analysis 4.4

- Enhancements to the PRA-type systems SMA model beyond those in the original guidance
- “Mission time” for the accident analysis
- Selection of the Seismic Equipment List

Fragility and Capacity 4.5

- Plant walkdown methodology
- Screening approach and level for of SSCs
- Fragility analysis method for evaluation of the HCLPF capacity of an SSC
- CDFM method for evaluation of the HCLPF capacity of an SSC

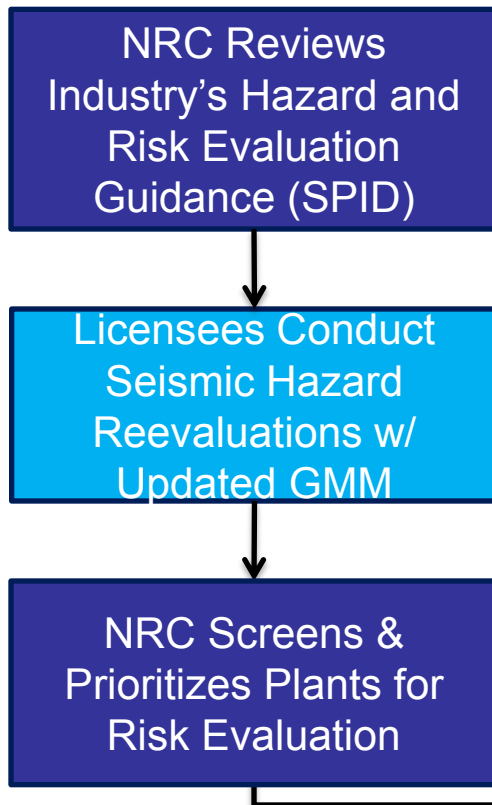
SMA Integration 4.6

- Plant margin evaluation using the Convolution Method for sequence-level and plant-level HCLPF capacity
- Guidance on using the “Min-Max” method for sequence-level and plant-level HCLPF capacity

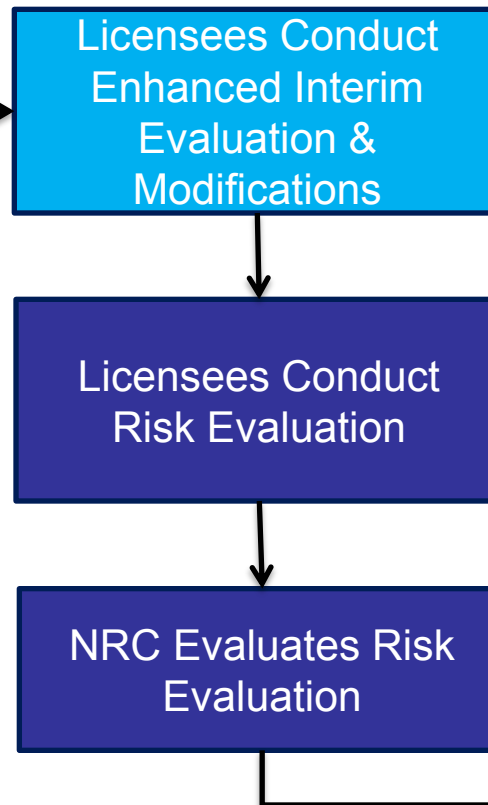
R2.1 Overall Approach

PHASE 1

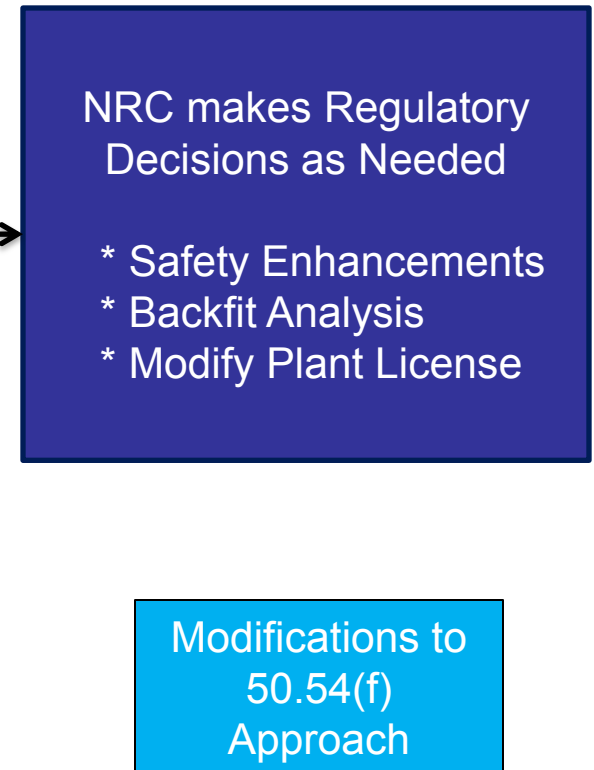
STAGE 1



STAGE 2



PHASE 2



Industry Proposed Alternative Approach

- Enhanced interim seismic evaluations and potential upgrades for FLEX Phase 1 installed plant equipment
- Licensees conduct interim evaluations
 - for plants where new hazard exceeds design basis
 - in parallel with detailed risk evaluations described in SPID guidance
- Licensees develop an expedited seismic equipment list (ESEL) from FLEX for scenarios involving loss of AC Power

Industry Proposed Alternative Approach

- Strategy for coping with loss of AC Power relies initially on installed plant equipment (FLEX Phase 1)
 - BWR: RCIC pump and valves etc. and electrical equipment
 - PWR: AFW pump and valves etc. and electrical equipment
- Using reevaluated hazard (GMRS) licensees develop Review Level Ground Motion (RLGM = Scaled SSE)
- Demonstrate that ESEL items have sufficient capacity to meet RLGM
- Modify ESEL items whose HCLPF is less than RLGM

Path Forward

- Staff and industry work to reach consensus on GMM for CEUS by August 2013
- Industry to formally ³⁷Submit Alternative Approach